



# CHEMICAL ABSTRACTS

Vol. 17.

JULY 20, 1923

No. 14

## 1—APPARATUS

C. G. DERRICK

**Simplification of laboratory apparatus for science and technology.** H. RABE. *Ber. pharm. Ges.* 33, 83-95(1923).—An address. W. O. E.

**A disregarded danger of explosion in vessels (flasks, bombs) for compressed and liquefied gases.** WALTER SCHREITMÜLLER. *Chem. App.* 10, 77-9(1923); 4 cuts.—The loss in wt. of a vessel through use is not a safe indication of its condition because the walls may be dangerously weakened by the formation of interior crusts of oxides, crystals, etc., which are very hard to remove during cleaning and may even increase the wt. of the vessel. J. H. MOORE

**Sublimation as an analytical procedure.** JULIUS HORTVET. *J. Assoc. Official Agr. Chem.* 6, 481-9(1923).—In order to meet the requirements incidental to the various operations involved in sublimation processes, a new model sublimator (shown in the original) has been designed to serve all the purposes which have been fulfilled, to a greater or less degree, by a number of well known lab. devices. The app. is described in detail. The results are obtained in subliming various well known compds. W. O. E.

**A new apparatus for the quantitative absorption of gases, particularly carbon dioxide of respiration.** HORACIO DAMIANOVICH. *Anales asoc. quim. Argentina* 10, 299-308(1922).—The fibrous material from the interior of the vegetable sponge gourd is an ideal absorbent for the 66% KOH soln. used as a CO<sub>2</sub> absorbent. It is not attacked by the reagent and will hold a larger amt. of soln. than any other porous substance tried. A series of 3 U-tubes 2.5 cm. in diam. having a total effective length of 1.6 m. when filled with the wet fiber weighs less than 500 g. and will completely absorb the CO<sub>2</sub> from at least 20 min. respiration of an adult (about 8 g. CO<sub>2</sub>). L. E. GILSON

**Devices for removing gases from oxygen in the laboratory.** M. FOHLEN. *Chimie et industrie* 9, 714(1923).—H is removed by passing the O through a glass or quartz tube contg. a Pt coil electrically heated to redness, and then drying it.

**Laboratory apparatus for concentrating in vacuo.** NICOLAUS BAN. *Chem. Ztg.* 47, 366(1923). A. PAPINBAU-COUTURE  
J. H. MOORE

**Safety locking device for filter press.** W. J. TAIT. *Eng. Mining J.-Press* 115, 938(1923).—An illustrated description of a device to prevent opening of a filter press head while under internal pressure. It consists of a diaphragm and plunger operating 2 safety catches held down over the locking yoke. C. C. DAVIS

**Apparatus for aeration of solutions.** R. V. THURSTON. *Eng. Mining J.-Press* 115, 938-9(1923).—An app. is described and illustrated for aerating a deep column of liquid. Air enters at the bottom in many small bubbles through small holes pricked in rubber tubing. The liquid is stirred by a stationary tube with open ends reaching nearly to the bottom, with the top end below the surface. Difference in d. causes a current down the tube. C. C. DAVIS

**A stirring device.** H. W. GEORGE. *Ind. Eng. Chem.* 15, 728(1923); illus.—The device is for use in a narrow-necked, balloon-shaped flask. E. J. C.

**A further improvement in the Sprengel pump.** J. J. MANLEY. *Proc. Phys. Soc. London* 35, 137-9(1923).—The present improvement consists in providing for a Hg seal during periods when the pump is not in use, thus preventing the formation of new air-skins on the glass (cf. *C. A.* 16, 2242). C. C. VAN VOORHUIS

**Light filter with variable transmission.** ECON BUTSCHOWITZ. *Chem.-Ztg.* 47, 382(1923).—A photographic ray filter consisting of 2 long glass right triangles with thick ends in opposite directions and sliding upon each other on the inclined planes. The intensity of the color in 1 triangle gradually increases from left to right while the intensity in the other decreases from left to right at the same rate, so that the color over the entire field is uniform for all relative positions of the triangles but the amt. of light transmitted varies with their combined thickness. J. H. MOORE

A noiseless inductor to be used with an alternating current. FERD. SCHEMINZKY. *Klin. Wochschr.* 2, 448-9(1923).—Current from a 110-220 v. a. c. lighting circuit is passed through a rectifying bulb. The induced current, although direct, is intermittent and elicits a powerful response from a sensitive telephone receiver. This app. is especially useful for cond. measurements because of its noiselessness. MILTON HANKE

A laboratory optical pyrometer: notes on its design and operation. WM. SCHRIEVER. *Proc. Iowa Acad. Sci.* 28, 69-82(1921).—An optical pyrometer suitable for accurate temp. detns. and flexible enough to be of general use in a physical lab. is described with illustrations. A brief sketch of the theory and design of a Holborn-Kurlbaum optical pyrometer is included (cf. *C. A.* 16, 4087). W. G. GARSSLER

A thermoelement for radiation measurements. RUDOLF HASE. *Z. Physik* 15, 52-3(1923).—A short piece of an alloy which will give a very high thermoelec. force is welded to suitable leads and placed in a thin-walled, highly evacuated glass bulb. The black collecting disk is fastened to the "hot junction" and the cold junction is in the shadow of the disk. A novel mounting of the thermoelement and galvanometer cuts out all extraneous radiation and the scale, which is calibrated to read the black-body temp. directly, is illuminated by the radiating body. The instrument is suitable for measuring all temps. above 500°. C. C. VAN VOORHIS

Laboratory apparatus for heating at high temperatures. GEORGES CHAUDRON AND M. GARVIN. *Chimie et industrie* 9, 647-50(1923).—Brief description of the Tamman, Arsem, and Ruff furnaces. C. and G. designed a vacuum furnace for high temps., consisting essentially in a double-walled metal body in 3 sections: base, contg. suction, gas, electricity and water connections; body proper and cover. Water can be circulated through the 3 portions. Heating is obtained by means of an internally wound W coil, which can be heated 8 times up to 2000° before wearing out. A vacuum of 0.001 mm. can be obtained cold and 0.02 mm. hot. An app. for winding the W coils is described. A. PAPINEAU-COUTURE

Machinery for bagging superphosphate. KAI WARMING. *Chem. Met. Eng.* 28, 893-4(1923).—The machine is designed to cut into a pile of superphosphate and to crush, sieve and bag the material. The cost of operation for a machine having a capacity of 150 bags per hr. is about half that of hand labor. E. G. R. ARDAGH

#### Sublimation of plant and animal products (VIEHOEVER) 17.

Chemical precipitation apparatus. B. B. FOGLER. U. S. 1,456,102, May 22. The app. is adapted for treating Na tungstate and NaNO<sub>3</sub> with HCl and comprises a kettle with delivery tubes for supplying pptg. reagents to it.

Rotating cylindrical retort for calcination, roasting or distillation. F. D. MARSHALL. U. S. 1,456,392, May 22.

Apparatus for reactions under pressure. ERLING JOHNSON. Norw. 34,972, May 29, 1922. A combination of autoclaves to save space and conduction pipes.

Fractionating column for laboratory use. H. C. P. WEBER. U. S. 1,454,874, May 15. A condenser section which may be formed of glass is provided with one or more chambers each having a liquid-sealing cup at its bottom with a depending projection.

Apparatus for condensing steam, etc. R. N. EHRHART. U. S. 1,456,870-1, May 29.

Apparatus for treating liquids with vapors. NIEDERHAUSEN & Co. SAUERSTOFFWERK LENZBURG, E. v. Brit. 189,442, Nov. 7, 1922. In columnar app. for treating liquids with vapors serving as a countercurrent condenser or rectifying app., e. g., for purifying liquid N, the plates are formed by bands or tapes wound in spiral form on a central bush or folded in zigzag form, the windings being spaced apart at such a distance that the liquid will remain between the windings.

Thermometer. ZENHACHI KATO. Japan. 41,241, Dec. 22, 1921. The capillary section of the thermometer is triangular or has a sharp edge and the bulb to contain Hg, etc., has the form of a gourd, by which the breaking of the liquid is prevented or the liquid easily united when broken.

Crucibles, retorts, etc. FEROLITE, LTD. AND H. B. CLAPP. Brit. 189,692, Feb. 7, 1922. Crucibles, retorts, and other vessels for high temp. work are molded from a mixt. of chromite and ferro-Si with a binding agent such as Na silicate soln. Cf. 183,219.

Laboratory still for fractional distillations. H. C. P. WEBER. U. S. 1,451,603, Apr. 10. The still comprises a pair of glass flasks with necks and branch tubes so arranged that (although the necks are interconnected) liquid may be poured from either flask without pouring from the other.

**Distilling apparatus.** TATSUO KIJIMA. Japan. 41,270, Dec. 27, 1921. The distg. app. is constructed with cylindrical towers and condensers. It is used mainly for the *distn. of petroleum*. Electrically heated plates are fixed in the tower in an inclined position, over which liquids are poured in thin stream and distd.

**Fusion kettles.** O. S. SLEEPER. U. S. 1,458,108, June 5. Kettles adapted for fusion of org. compds. are mounted upon a saddle which may be tilted toward a spout upon its supporting frame. A stirring app. is mounted so as to operate within the kettle but it may be tilted in an opposite direction from that in which the kettle tilts so as to clear the kettle when the latter is tilted to discharge material from it.

**Pressure oil filter.** F. E. COLLINS. U. S. 1,456,095, May 22.

**Rotary filter.** MYRENS VERKSTED, A/S. Norw. 35,636, Aug. 28, 1922. An endless cloth of air-tight fabric is conveyed over the filtering surface on the parts situated above the level of the liquid.

**Photometer.** F. E. IVES. U. S. 1,457,076, May 29.

**Combined colorimeter nephelometer.** S. R. BENEDICT and J. C. BOCK. U. S. 1,456,964, May 29.

**Pump for fibrous liquids.** P. C. SCHAANING. Norw. 34,416, Mar. 20, 1921. A pump for cellulose liquor, etc. Compressed air is added in the pipe between the pump and the outlet.

**Valve of acid-resistant metals.** ERLING EKENAES. Norw. 36,337, Dec. 4, 1922. The valve is easily manufd. by grinding, the seat being a single plane.

## 2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE I. CLARK

**Joseph Gillet, 1843-1923.** CAMILLE MATIGNON. *Chimie et industrie* 9, 645-6 (1923).—An obituary with portrait.

**The equipment of laboratories of the Rikwagaku Kenkyujo.** JIRO TAKENAKA. *Rikwagaku Kenkyujo Iho* 1, 45-54 (1922).—This Institute of Physical and Chemical Research has the most complete lab. in Japan. K. K.

**Some fundamental atomic weights.** E. MOLES and J. M. CLAVERA. *Anales soc. españ. fis. quim.* 20, 550-4 (1922).—The following revised values for at. wts. are given: Cl 35.457, Br 79.926, F 19.000, C 12.000, N 14.008, Na 22.998. These values are derived from the work of the authors and associates during the last six years, wherein these elements have been checked against each other through various reactions and the above values found to be in complete harmony.

**Is hafnium a new element?** K. A. GRÖNVALL. *Svensk Kem. Tids.* 35, 68-70 (1923).—This question is put by G. in consideration of certain Zr earth fractions which have been reported in the past as of new elements, namely: ostranium by Breithaupt of Freiberg in 1825, norium by Svanberg of Upsala in 1845, and jargonium by Sorby of England in 1869 (cf. *Z. Kryst.* 16, 101; *Pogg. Ann.* 65, 317). A. R. ROSE

**The structure of sodium chlorate.** G. WULF. *Z. Kryst.* 57, 190-200 (1922).—The Röntgenogram was employed in detg. the structure of the right and left rotatory forms of  $\text{NaClO}_3$ . The detd. values were: edge length of unit cube 6.76 Å., no. mols. per unit 4.4. The 2 structures can be differentiated by the sense of rotation of  $\text{ClO}_3$  ions in their planes. PAUL BOONE

**The space lattice of cadmium oxide.** P. SCHERRER. *Z. Kryst.* 57, 186-9 (1922).—In  $\text{CdO}$ , the Cd and O ions lie exactly as Na and Cl in rock salt. The edge length of the elementary cube ( $a$ ) equals  $4.72 \times 10^{-8}$  cm. From the formula  $\rho = Z \cdot M \cdot m_H / a^3$ , the no. of atoms ( $Z$ ) equals 4.03. ( $M$  = mol. wt.;  $m_H$  = mass H atom.) The Cd atom is congruent and parallel to the O atom. PAUL BOONE

**Molecular and crystal symmetry.** T. V. BARKER. *Nature* 111, 632-3 (1923).—Criticism of Shearer's rules for relating the symmetry of a crystal and that of the component mols. (*C. A.* 17, 1741), previously stated by Federov in 1912, as  $pm = n$ , where  $n$  is the symmetry no. of the unit crystal cell,  $m$  the no. of mols. it contains, and  $p$  the symmetry no. of each mol. Shearer and Bragg (*C. A.* 17, 1172) have postulated certain special values of  $p$  in order to test the principle, which are not expld. and not what one would expect from chem. knowledge. B. disagrees with the structure analysis of tartaric acid made by Astbury (*C. A.* 17, 1740) upon the basis that the mol. is asym. The mol. 2-fold axis normal to Astbury's "dumb-bell" axis introduces a real symmetry; hence the structure is not simply made up of a single space lattice arrangement, with the mol. axes uniting to create the symmetry axis of the crystal, but is constructed of 2 interpenetrating lattices, the office of the second being to restore the symmetry lost by a



refusal of the crystal to recognize mol. symmetry. Hence the Federov-Shearer principle is infringed to the utmost possible limit. Compds. of the type  $\text{CB}_4$  and  $\text{SnI}_4$  should afford the most satisfactory test of the principle. [The principle is not disproved by Dickinson's rigorous analysis of  $\text{SnI}_4$  (*C. A.* 17, 1740). The fact that 8 mols. per unit cube were found whereas 24 asym. mols. are the minimum no. required for the dyakisdodecahedral class shows that the mol. has a symmetry no. of 3, i. e., a trigonal axis, just as is true of diamond and as would be anticipated from the tetrahedral arrangement of I atoms around Sn. ABSTRACTOR.] G. L. CLARK

**The volume of mercury menisci.** J. PALACIOS. *Physik. Z.* 24, 151-5(1923).—The vol. of a Hg meniscus is calcd. from a series of accurate measurements of its height at various known distances from its center. From a large no. of detns. made simultaneously with surface-tension measurements, it is concluded that the vol. is a function of the height and radius only. The exact detn. of meniscus vol. has an application in the accurate reading of gas thermometers; a table of vols. is given for various heights and radii. J. A. ALMQUIST

**A study of the allotropy of tellurium.** A. DAMIENS. *Ann. chim.* 18, 282-312 (1922); cf. *C. A.* 16, 2630.—On heating cryst. Te, prepd. by different methods, slowly and uniformly, the temp.-time curve shows no breaks until the m. p. is reached. The same result is obtained on cooling. The m. p. is  $453^\circ$ . The d. of Te crystd. from the liquid is 6.236; that crystd. from the vapor has a d. 6.310. On heating the former at temps. below the m. p. the d. approaches the higher value. This change is more rapid the higher the temp. The higher value is believed to be the true d. of cryst. Te, while the lower value is due to porosity. The change on heating is the result of slow recrystn. through the vapor phase. The d. of amorphous Te free from oxide is 5.85-5.87. On heating this changes to cryst. Te with a corresponding change in d. From a study of the heat of reaction of cryst. and amorphous Te with a mixt. contg. 400 g. concd.  $\text{HCl}$ , 400 g.  $\text{H}_2\text{O}$ , and 40 g. Br, the heat of transformation of amorphous to cryst. Te was found to be + 2.63 cal. per g. atom. The negative value obtained by Berthelot and Fabre, *Ann. chim. phys.* [6] 14, 92(1888), is attributed to the presence of oxide. F. L. BROWNE

**Measurements of the density of aluminium halides, with mercury as the pycnometer liquid.** WILHELM BILTZ AND WALTER WEIN. *Z. anorg. allgem. Chem.* 121, 257-65(1922).—By the pycnometer method, the d. of  $\text{AlCl}_3$  was detd., toluene being used, and of  $\text{AlBr}_3$  and  $\text{AlI}_3$ , Hg being used. The mean values were  $\text{AlCl}_3$ ,  $d_4^{25}$  2.44,  $\text{AlBr}_3$ ,  $d_4^{25}$  3.01,  $\text{AlI}_3$ ,  $d_4^{25}$  3.98. Mol. vols. calcd. from these (assuming  $\text{AlF}_3$  d. = 3.10) were  $\text{AlF}_3$  27.1,  $\text{AlCl}_3$  54.7,  $\text{AlBr}_3$  88.7,  $\text{AlI}_3$  102.5. C. C. DAVIS

**Heteromorphism of calcium carbonate. Marble, synthetic and metamorphic.** MAURICE COPISAROW. *J. Chem. Soc.* 123, 785-96(1923).—Expts. have been carried out for the purpose of investigating the colloidal and gelatinous state of  $\text{CaCO}_3$  observed by Neuberg and Rewald (cf. *C. A.* 3, 155), and the transformation of the various forms of  $\text{CaCO}_3$ . The results obtained indicate the following: (a) The formation of hydrocalcite, calcite, aragonite and pptd. chalk by double decompn. of alkali carbonates and sol. Ca salts is effected in stages—diffusion, soln., gelatinous form, and solid. The final form of the solid depends on exptl. conditions. (b) The gelatinous phase obviated by slow diffusion may, under favorable conditions, be prolonged practically indefinitely. This form, which exists in aq. medium, has a shorter range of existence and can be less definitely characterized than the colloidal  $\text{CaCO}_3$  prepd. by Rose (cf. *Pogg. Ann.* 42, 354). It may be regarded as unorientated mol. aggregates of hydrocalcite formed in the course of a forced transformation of the initial liquid magma into hydrocalcite. (c) The effect of pressure results in the formation of cryst. instead of amorphous  $\text{CaCO}_3$ . (d) No indication has been obtained of the formation of double salts of the type of halite and gay-lussite. A new synthesis of marble has been evolved which gives a new aspect to the metamorphosis of this substance, an aspect not only distinct from, but also opposed to, the existing igneous theory of its geological formation. It has been found that the influence of pressure extends beyond facilitating crystn. Thus, the additional effect of suitable pressure exerted in conjunction with conditions favorable to the formation of calcite results in the formation of marble. A substance which is chemically identical with natural marble of good quality and closely resembles it in phys. properties has been prepd. by (a) double decompn. of alk. carbonate and a sol. Ca salt at moderate pressure and temp., and (b) heating powd. limestone or pptd. chalk with a concd. soln. of  $\text{NaCl}$  in an atm. of  $\text{CO}_2$  under pressure. Soln. seems to be a characteristic feature of all these transformations, combination of favorable conditions of crystg. medium, solvent, concn., temp. and pressure leading to the formation of marble. Heteromorphism

of calcium sulfate. Alabaster and its synthesis. *Ibid* 796-9.—The transformations of  $\text{CaSO}_4$  have been studied along similar lines to those employed with  $\text{CaCO}_3$ . Neither a state of temporary supersatn. nor gelatinization occurs in the formation of  $\text{CaSO}_4$ , probably because of the fact that  $\text{CaSO}_4$  shows no tendency to form varieties of hydrates of greater hydration than that of gypsum. Double decompn. of  $\text{Na}_2\text{SO}_4$  and  $\text{CaCl}_2$  under pressure results in the formation of gypsum in the form of coarse granular particles. Double decompn. at high temp. yields finely granular, compact anhydrite. Double decompn. at high temp. and pressure produces an alabaster-like substance of considerable cohesion. This double decompn. was carried out with either (a) hydrated  $\text{Na}_2\text{SO}_4$  and anhyd.  $\text{CaCl}_2$ , (b) anhyd.  $\text{Na}_2\text{SO}_4$  and hydrated  $\text{CaCl}_2$ , or (c) hydrated  $\text{Na}_2\text{SO}_4$  and  $\text{CaCl}_2$ . Method (a) gave the most satisfactory result, yielding a product of max. compactness. The mechanism of the formation of alabaster is essentially the same as that of marble.

H. JERMAIN CREIGHTON

The distribution of molecules in a gas; application to the van der Waals equation. J. HAAG. *Compt. rend.* 176, 372-5 (1923).—Considering a gaseous mass composed of  $N$  spherical and identical mols. in vol.  $V$ , the probability  $P_n$  that there will be  $n$  mols. in a vol.  $v$ , arbitrarily chosen in  $V$ , is calcd. when the dimensions of the mols. are taken into account. A correction factor to the classical equation is obtained which corrects for the vol. of the mols.

E. N. BUNTING

A new equation of state for gases. A. LEDUC. *Compt. rend.* 176, 1132-4 (1923); cf. *C. A.* 16, 3579; 17, 2211.—The new equation  $p = (RT/M)[v/(v-a)^2] - [3.16a/(v+a)^2(4^2-1)]$  in which  $a$  for  $\text{CO}_2$  is 0.3606 and  $k$  is  $T_c/T$  agrees within 0.6% with Amagat's data for  $\text{CO}_2$  up to 100 atm.

JAMES M. BELL

The aeration of quiescent columns of distilled water and of solutions of sodium chloride. W. E. ADENEY, A. G. G. LEONARD AND A. RICHARDSON. *Phil. Mag.* (6) 45, 835-45 (1923).—The aeration of quiescent bodies of fresh or salt water under natural conditions is effected by a process of mixing of the exposed layer to depths of 10 ft. at least. Mixing is caused by the downward "streaming" of the constantly changing exposed layer of water probably to depths much greater than 10 feet. The streaming process takes place more uniformly in salt than in fresh water, and is largely dependent on cooling by evapn. from the surface, and is more rapid at  $10^\circ$  or above. An optimum concn. of salt appears to be about 1%.

S. C. L.

The form of the vapor-pressure curve at high temperatures. II. The curve for sodium cyanide. C. K. INGOLD. *J. Chem. Soc.* 123, 885-91 (1923); cf. *C. A.* 17, 907.—The vapor pressure of  $\text{NaCN}$  was measured over the range of temp. 800-1360°. This substance was chosen as a triatomic substance of the same order of volatility as  $\text{Pb}$ . Exptl. methods were the same as those described in the first paper. The  $\text{NaCN}$  was prepd. from  $\text{HCN}$  and  $\text{NaOH}$  and contained 99.8%  $\text{NaCN}$ . The  $\text{NaCN}$  was analyzed after each expt. and the results were rejected if it contained less than 99.5%  $\text{NaCN}$ . This was necessary because a small amt. of  $\text{CO}$  from the heated  $\text{C}$  tubes converted a slight amt. of the  $\text{NaCN}$  to  $\text{Na}_2\text{CO}_3$ . Curves are given showing that the total vapor pressure of a mixt. of  $\text{NaCN}$  and  $\text{Na}_2\text{CO}_3$  at  $1000^\circ$  and at  $1100^\circ$  is a linear function of the mol. compn. and that the error caused by the presence of 0.5% of  $\text{Na}_2\text{CO}_3$  in the  $\text{NaCN}$  is negligible. As was found to be the case with  $\text{Pb}$ , the vapor pressure of  $\text{NaCN}$  as a function of temp. is very accurately expressed by the Ramsay-Young empirical formula, with  $\text{Hg}$  as the comparison liquid. Both the Nernst and the Henglein formulas deviate materially from the exptl. values, the disagreement being much more marked than was found for  $\text{Pb}$ . The b. p. of  $\text{NaCN}$  at atm. pressure is  $1500^\circ \pm 10^\circ$  and the latent heat 37000 cal. per g. mol.

F. L. BROWNE

The viscosity of liquids. C. V. RAMAN. *Nature* 111, 600-1 (1923); cf. *C. A.* 17, 2211.—A further consideration of the composite nature of liquids, composed in part of mols. "rigidly" attached as in solids, and in part of mols. relatively mobile as in the gaseous state.

G. L. CLARK

Theory of the capillary layer of a liquid in contact with its saturated vapor. G. BAKKER. *Z. physik. Chem.* 104, 10-45 (1923).—A mathematical and theoretical paper in which the following topics are treated: criteria for the equil. of a liquid; the law of Pascal and the capillary layer; potential function of the attractive force; the mean pressure in the longitudinal direction of the capillary layer, and the theoretical isotherm; interpretation of the labile portion of the theoretical isotherm; small liquid drops and gas bubbles; thermodynamic considerations with reference to curved and flat capillary layers; d. of the capillary layer. It is shown that at a definite temp. the surface tension is independent of the curvature of the capillary layer.

H. JERMAIN CREIGHTON

Electrostatic theory of anomalous liquids. J. J. BIKERMAN. *Z. physik. Chem.* 104, 55-73 (1923).—If the mol. wts. of alcs. are assumed to be normal, then their de-

viations from the rules of Eötvös and van der Waals lead to the conclusion that their surface tensions and vapor pressures are abnormally small. These two anomalies can be explained as consequences of an elec. double layer at the surface of the alcs. These double layers, calcd. on the basis of this assumption, have thicknesses of ordinary mol. magnitudes and potential differences which agree with those detd. by the electro-osmotic method. The relation between the anomalies and the dipolar structure of the mol., and the role of the dipole distribution in the production of the double layer are discussed. The anomalous viscosities and crit. coeffs. point to abnormal internal pressures.

H. JERMAIN CRRIGHTON

**Metal sols in non-dissociating liquids. I. Nickel in toluene and benzene.** EMM. HATSCHKE AND P. C. L. THORNE. *Proc. Roy. Soc. (London)* 103A, 276-84(1923).—The soln. of Ni carbonyl in benzene begins to dissociate below the b. p., turning greenish brown, and (generally below b. p.) black, the Ni being deposited as a coagulum. Coagulation is not prevented by liquid paraffin; so protective colloids were tried. Ca oleate and rosin give pale brown sols, but crêpe rubber dissolved in benzene gives brown, moderately stable sols. On heating 750 cc. of a soln. of Ni carbonyl in toluene contg. 1.4100 g. Ni per l. and 150 cc. of 1% benzene rubber sol, the liquid turns clear brown and only after 1 $\frac{3}{4}$  hrs. gives a black sol; one of these has remained stable over 6 months. However, if the rubber is dissolved in toluene instead of benzene, only greenish or greenish brown sols are obtained. In the ultramicroscope the particles show white, and, owing to low viscosity of the dispersing medium, the Brownian motion is particularly vivid. The sol may be concd. considerably, but is not reversible on desiccation. It is miscible with other hydrocarbons (*e. g.*, paraffins) without coagulation; however, 1 or 2 vols. of a liquid miscible with toluene but not a solvent for rubber (*e. g.*, acetone), gives a coagulum, which though partly peptized by benzene or toluene when fresh, becomes insol. on drying. In a Nernst Ni cell, with electrodes 5 mm. apart and 200 v. at the terminals (potential gradient = 400 v./cm.), a 1-hr. exposure gives identical uniform brown films on both electrodes. The deposit contains considerable rubber; *e. g.*, a sol. having a Ni-rubber ratio of 3 : 5 gives a deposit with the ratio 5.6 : 5 (a decrease). Electrophoresis in fields of different strengths, all other factors being equal, shows that the amts. deposited are proportional to the first or a lower power of the potential gradient. The charge, therefore, is not induced, but positively and negatively charged particles are originally present in the sol. Examn. of this anomalous condition in the ultramicroscopic dark field shows a curious drift in layers, or absence of drift. When the field is cut off the particles cease drifting with a "jerk," and resume normal Brownian movement. Uniform drift does not persist, even near the electrodes.

JEROME ALEXANDER

**Indicator method for the determination of coefficients of diffusion in gels, with special reference to the diffusion of chlorides.** WALTER STILES. *Proc. Roy. Soc. (London)* 103A, 260-75(1923).—The biological and physiol. importance of diffusion in gels is emphasized. With the formation of AgCl as an indicator of the extent of diffusion, expts. were made with the chlorides of NH<sub>4</sub>, Li, K, Na, Ca, Ba, Mg and quinine in 0.5% agar gels. The relation between the coeff. of diffusion and temp. is not a linear one (as usually assumed in diffusion in H<sub>2</sub>O), but increases more rapidly the higher the temp. The concns. of both gel and salt influence diffusion. Empirical expressions are given for both these relationships.

JEROME ALEXANDER

**Determination of the isoelectric point of gelatin—A criticism of Patten and Kellem's method.** T. S. PRICE. *J. Chem. Soc.* 123, 410-2(1923); cf. *C. A.* 14, 3430.—If Patten and Kellem's curves are correctly plotted, with normality instead of log normality, the straight-line portions compress to what are practically points of inflection. The fictitious straight-line portion of the curve has nothing to do with the isoelec. condition of the gelatin, but is fixed by the  $p_H$  of the original gelatin. Since their original com. gelatin was alk., their method simply shows that more acid is needed to give a definite  $p_H$  to such a gelatin, than to an ash-free gelatin.

JEROME ALEXANDER

**The solubility of methane in water and organic solvents under pressure.** F. FISCHER AND CARL ZERBE. *Brennstoff-Chem.* 4, 17-19(1923).—The soly. of CH<sub>4</sub> in H<sub>2</sub>O and 25 different org. solvents has been studied at atm. pressure and at 17-8 atm. pressure. Petroleum ether b. to 65° is the best solvent. Et<sub>2</sub>O ranks second as a solvent, and petroleum ether b. 65-100° third. H<sub>2</sub>O, aniline, and C<sub>6</sub>H<sub>5</sub>NO<sub>2</sub> are the poorest solvents. At 1 atm. pressure and 20° the no. of cc. of CH<sub>4</sub> dissolved by 1 g. of solvent is as follows: petr. ether b. to 65°, 1.34; Et<sub>2</sub>O, 0.91; petr. ether b. 65-100°, 0.84; H<sub>2</sub>O, 0.09.

C. T. WHITE

**The solubility of selenium in caustic alkali.** G. CALCAGNI. *Gazz. chim. ital.* 53, 114-19(1923).—The expts. were carried out as in the case of S (*C. A.* 15, 2764). 68%

KOH and NaOH,  $\text{NH}_3$  (d. 0.888) and satd. cold  $\text{Ba}(\text{OH})_2$  were placed in 200-cc. bottles. Powd. Se was added to all, and was easily dissolved in the NaOH and KOH solns. Se was dissolved in  $\text{Ba}(\text{OH})_2$  only by heating on the  $\text{H}_2\text{O}$  bath and not even then in  $\text{NH}_4\text{OH}$ . After many months a small amt. of Se was dissolved in  $\text{NH}_4\text{OH}$ . Se was added to the KOH and NaOH solns. until no more was dissolved. After some time crystals of Se were sepd. C. considers that this may be due to the fact that the soln. becomes supersatd. with respect to amorphous Se and that the excess seps. in the crystal form. The alkali was detd. as the sulfate and the Se as such. A portion of the soln. was treated with concd. HCl and a satd. soln. of  $\text{SO}_2$  (or with  $\text{SO}_2$  gas to satn.). Later the soln. was warmed to expel  $\text{SO}_2$ . The Se was filtered off, washed with  $\text{H}_2\text{O}$  and abs.  $\text{EtOH}$ , dried and weighed. The filtrate was concd., treated with  $\text{H}_2\text{SO}_4$ , evapd. and weighed as sulfate. 100 cc. KOH soln. dissolved 9.19 g. Se (39.15 g. K (1 atom) : 14.91 g. Se), which shows that not all the Se is in the form of selenide. A little Se could be extd. from the soln. with  $\text{CS}_2$ . Some evidence for the presence of some  $\text{K}_2\text{Se}_2\text{O}_3$  was obtained. The results indicate that with KOH Se forms selenides, selenites and probably some  $\text{K}_2\text{Se}_2\text{O}_3$ . 100 cc. NaOH soln. dissolved 2.45 g. Se. The products formed and the behavior of the soln. resembled the KOH soln. After several days at  $80^\circ$  100 cc. of the  $\text{Ba}(\text{OH})_2$  soln. dissolved 2.65 g. Se. Since the ppt. with  $\text{SO}_2$  was small selenites were mostly formed in this case together with some of the salt of  $\text{H}_2\text{Se}_2\text{O}_3$ . In general the reactions of alkalis on Se are complicated and gradual. Selenides are formed at first and these are transformed into polyselenides and selenites. The salts of  $\text{H}_2\text{Se}_2\text{O}_3$  are probably formed by the action of  $\text{O}_2$  on the selenides.

E. J. WITZEMANN

The temperature of maximum density of aqueous solutions. ALAN TAFFEL. *Trans. Faraday Society* (advance proof) 1923.—The temp. of max. d. is calcd. for a no. of aq. solns. from the sp. vols. of the constituents and the "soln.-contraction" which is defined, for a given concn. and temp., as the contraction resulting from the addn. of 1 g. solute to water. The calcd. values agree fairly well with the exptl. detns. In most cases the "soln.-contraction" increases with decreasing temp., and the temp. of max. d. is below  $4^\circ$ . If the "soln.-contraction" decreases as the temp. is lowered, the temp. of max. d. may be either above or below  $4^\circ$ . Several tables of data are given for the "soln.-contraction" and temp. of max. d. of various substances, which illustrate also the sp. effect of ions and mols. on the depression of the temp. of max. d.

J. A. ALMQUIST

New conceptions of electrolytes. III. The hydration of the hydrogen ion. ER-LING SCHREINER. *Z. anorg. allgem. Chem.* 121, 321-34(1922); cf. *C. A.* 16, 2246.—Detns. of the hydration values of  $\text{H}^+$  were made by measuring the  $\text{H}^+$  activity in 0.001 0.002 and 0.005 molar HCl in KCl solns. of 0.001-3.0 molar concn. and in pure HCl of the same 3 concns. The detns. were carried out at  $18^\circ$  with the hydroquinone electrode of Biilmann (cf. *Festschrift, Kjöbenhavnns Universitet* Nov. 1920). Calling  $m$  the no. of  $\text{H}_2\text{O}$  mols. bound (cf. *C. A.* 14, 2286) and assuming the reactions to be:  $\text{C}_6\text{H}_5\text{O}_2\text{H}_2 + 2\oplus \rightarrow \text{C}_6\text{H}_5\text{O}_2 + 2\text{H}^+$ ;  $2\text{H}^+ + 2m\text{H}_2\text{O} \rightarrow 2\text{H}^+m\text{H}_2\text{O}$ ,  $m$  was calcd., with several theoretical assumptions, to be 8.5. By using an approx. formula derived for the activity of the  $\text{H}_2\text{O}$ , this value is reduced to 7.4, and in turn allowing in this formula for the concns., the mean value of  $m$  was 7.7.

C. C. DAVIS

Concentration of ions of insoluble or undissociated salts in solution. B. S. NEUHAUSEN. *Science* 57, 528(1923).—It is suggested that the calcs. of solys. of sulfides from e. m. f. measurements should not be taken literally but rather as measures of the activities of those ions in the solns. measured.

BENJAMIN S. NEUHAUSEN

Constitution of ampholytes, especially of the amino acids, and their dissociation constants. NIELS BJERRUM. *Z. physik. Chem.* 104, 147-73(1923).—The aliphatic amino acids in the undissociated state are present (to more than 99.5%) as salt-like ions,  $^+\text{NH}_3\text{R.COO}^-$ . These acids are not true amino acids, but rather  $\text{NH}_4$  salts. The presence of H or OH ions in their solns. does not indicate that they are acids or bases, but merely that as salts they undergo hydrolysis. The constns.  $k_a$  and  $k_b$ , by means of which the acidic and basic character of these acids has been recognized heretofore, are not really dissoc. constns., but rather hydrolytic constns. The true dissoc. constns., which give the strength of the neutralized acidic and basic groups within the amino acid mol., are:  $K_a = K_{\text{H}_2\text{O}}/k_b$  and  $K_b = K_{\text{H}_2\text{O}}/k_a$ , where  $K_{\text{H}_2\text{O}}$  is the ionic product of water. The values of the constns.  $K_a$  and  $K_b$  are in accord with the structural formulas of the acids. These values can be estd. from the nature of the acidic and basic groups, provided the effects of the substituents are taken into consideration. Various chem. reactions indicate that aliphatic amino acids do not possess free  $\text{NH}_2$  groups. Their phys. properties are in agreement with their salt-like nature.

Further, they increase the soly. of other salts and dissolve more readily in salt solns. than in  $H_2O$ . In the aromatic amino acids, there are present both the ions  $^+NH_2R_1R_2COO^-$  and true amino acid mols.,  $NH_2R.CO_2H$ , with free  $NH_2$  and  $CO_2H$  groups (in quantities between 10 and 90%). In the aromatic amino phenols the salt-like ion form is wholly repressed. From the magnitude of the dissoc. const. of an ampholyte, it is possible to est. the proportion of the salt-like ion and the real amino acid. It is shown theoretically that for ampholytes  $K_aK_b$  probably never can be less than  $4K_{H_2O}$ . From this it follows that the portion of ampholyte present as cation and anion can never exceed 50%.

H. JERMAIN CREIGHTON

Adhesion forces in solution. IV. Influence of temperature on the distribution of substances between two phases. SERG. WOSNRESSENSKY. *Z. physik. Chem.* 104, 46-50 (1923).—The distribution of succinic acid between  $Et_2O$  and  $H_2O$ ,  $C_6H_5CO_2H$  between  $C_6H_6$  and  $H_2O$ , and  $Fe(CNS)_3$  between  $Et_2O$  and  $H_2O$  has been studied at a no. of temps. between  $273^\circ$  and  $333^\circ$  abs. The results obtained show that  $C_\infty = C_0e^{+4/T}$ , where  $C_\infty$  is the equil. concn. (absorption capacity), and  $C_0$  and  $\delta$  are consts. depending on the nature of the substance.

H. JERMAIN CREIGHTON

Rate of hydrogenation of cinnamic and phenylpropionic acids. E. K. RIDGAL. *Trans. Faraday Soc.* (advance proof) 1923.—Solns. of Na phenylpropionate and Na cinnamate undergo hydrogenation at equal rates of H uptake in the presence of Pd sol when present in large quantities. The rate of hydrogenation is governed by the rate of supply of H to the Pd in the liquid and is proportional to the square of the shaking speed, the reaction velocity being of zero order. For small quantities of Pd the reaction velocity is proportional to the Pd concn. and the phenylpropionate absorbs H at approx. twice the rate of the cinnamate. Above certain crit. limits the rate is independent of the shaking speed. The reaction velocity is within limits independent of the salt concn. The reaction velocity curves from old and fresh sols have been examd. All sols commence reaction with a velocity curve of zero order, but terminate in a reaction velocity curve of the first order. For active fresh sols the portion of the curve not of zero order is very small, while for aged sols the portion of the reaction following a first-order reaction is relatively large, and for very inactive sols the whole curve follows that of a first-order reaction. It is shown that the salts undergoing hydrogenation as well as the H are adsorbed. It is assumed that the adsorbed quantity in the case of active sols remains independent of the bulk concn. down to extreme dilns., but the limiting concn. in the case of old sols rises, owing to a decrease in the adsorptive power of the latter. The adsorbed salt remains on the surface until completely hydrogenated, hence the rate of hydrogenation of phenylpropionate is the same as that of the cinnamate, the former taking up 2 mols. of H in the same time as that in which the latter takes up 1.

JAMES M. BELL

Catalysis of hydrogen peroxide by colloidal ferric salts. J. DUCLAUX. *J. chim. phys.* 20, 18-29 (1923); cf. *C. A.* 1, 1509; 17, 487.—Colloidal ferric compds. and especially the oxychloride ( $n Fe_2O_3 \cdot Fe_2Cl_6$ ) prepd. by hydrolysis of  $Fe_2Cl_6$  at  $100^\circ$  and by dialysis of the resulting hydrosol possessed the same catalytic property of decomposing  $H_2O_2$  as ferrous and ferric salts. The reaction was studied by varying as much as possible the compn. and concn. of the hydrosol and the acidity of the medium. The concn. was varied by diluting the hydrosol with the filtrate prepd. by filtering a part of the hydrosol through collodion at a pressure below the max. osmotic pressure, which may be less than 10 cm. of  $H_2O$ . In order to vary independently the compn. of the hydrosol and the acidity of the medium it was necessary to prep. for each variation a new hydrosol under different conditions of temp., time of boiling, duration of dialysis and diln. of  $Fe_2Cl_6$  used. The progress of the decompn. of  $H_2O_2$  was followed by titrating samples with  $KMnO_4$  or when the quantity of Fe was considerable by measuring at successive intervals the quantity of heat evolved (cf. *C. A.* 2, 1521). The value of  $n$  in ( $n Fe_2O_3 \cdot Fe_2Cl_6$ ) was varied between 24 and 780. 129 values of  $k$ , the reaction const., were detd. for 19 different hydrosols. In accord with the previously stated theory (cf. *C. A.* 2, 504) the catalytic action was not due to the nucleus of the micella ( $n Fe_2O_3$ ) but to the active, ionizable part of the micella. The Fe ion had the same catalytic activity whether it formed a part of the mol.  $Fe_2Cl_6$  or of a colloidal complex. The decompn. was a reaction of the first order and in a medium of the same acidity for the same hydrosol  $k$  was proportional to the concn. of Fe.

H. M. McLAUGHLIN

The mechanism of catalytic reactions. Decomposition of hydrogen peroxide by metallic oxides. J. CLARENS. *Bull. soc. chim.* 33, 280-93 (1923).—For app. and methods see *C. A.* 4, 132; 16, 216. The metallic oxide catalyst was formed in the reaction chamber of a ureometer by mixing NaOH and a soln. of the salt of the metal. The order of addn. of the reagents was varied. The decompn. was followed by measur-

ing the increase in pressure due to the  $O_2$  liberated. Under the exptl. conditions the decompn. of  $H_2O_2$  is essentially a phys. phenomenon depending particularly upon the phys. state of the catalyst. It is not possible to det. the order of the reaction because only that part of the  $H_2O_2$  enters into the reaction which is adsorbed, this being only a fraction of the total amt. present. It is admitted that under other exptl. conditions chem. catalysis (intermediate-compd. formation) may play the dominant role.

F. L. BROWNE

**Heats of mixing of normal and associating liquids.** J. J. VAN LAAR. *Proc. Acad. Sci. Amsterdam* 25, 399–413(1923); cf. *C. A.* 17, 1745.—The equations for calcg. the heat of mixing of associating liquids are developed in terms of the phys. consts. of the liquids, as crit. pressure and temp., vol. change on mixing, and heat of dissoc. Calcd. values for several mixts. compare favorably with the observed.

E. N. BUNTING

**The cryoscopic study of binary organic mixtures.** NICOLAS PERRAKIS. *Compt. rend.* 176, 1137–40(1923).—F.-p. curves for 7 binary systems are given: (1)  $PhOH-EtOH$ , (2) *o*-cresol- $EtOH$ , (3)  $Ph_2O-EtOH$ , (4)  $C_6H_5-MeOH$ , (5)  $C_6H_5-EtOH$ , (6)  $C_6H_5$ -iso- $PrOH$ , (7)  $CaH_2$ -butyl alc. All the curves except 1 and 2 have long portions approaching the horizontal, indicating a state near immiscibility. A further evidence of this approach to immiscibility is the behavior of a little water, which causes the mixt. to form 2 liquid layers.

JAMES M. BELL

**Decomposition of nitrogen pentoxide.** M. BODENSTEIN. *Z. physik. Chem.* 104, 51–4(1923).—A brief discussion of a paper by Daniels and Johnston (cf. *C. A.* 15, 976).

H. JERMAIN CREIGHTON

**Photographic registration of critical points and of the irregularity of the dilatation of liquids.** C. MONTEMARTINI AND L. LOSANA. *Gazz. chim. ital.* 53, 89–94(1923).—The app. consists of an application of the Le Chatelier-Broniewski (*Rev. metall.* 9, 3, 134(1912)) photographic registering app. to the precise registration of the thermal dilatation of liquids and solids. The new attachment consists of a balance beam with a float and a counterpoise wt. on a screw. Graphs and data on the max. d. of  $H_2O$ , dilatation of mixts. of bisulfates of quinine and cinchonine, allotropic transformation of S and also of  $NH_4NO_3$  as detd. by this app. are given. For details of construction and use see the original.

E. J. WITZEMANN

**Physical chemistry of refractory oxides.** OLAF ANDERSEN. *Norg. Geol. Undersökelse, Skånska Raastofkomite Publication No. 1*, 56 pp.(1922).—Summary of recent high-temp. investigations of single refractory oxides and of systems contg. several of these oxides as components. A bibliography is given.

J. A. ALMQUIST

**Active hydrogen by electrolysis.** A. C. GRUBB. *Nature* 111, 671(1923).—If a soln. of  $H_2SO_4$  or  $KOH$  is electrolyzed with a very high current density, the H formed at the cathode contains an active constituent which combines with pure N to form  $NH_3$ .

G. R. FONDA

**The thermal electromotive force between palladium containing hydrogen and pure palladium.** FRITZ HEIMBURG. *Physik. Z.* 24, 149–51(1923).—The thermal e. m. f. of this couple has been measured for temp. differences up to  $100^\circ$  and for various concns. of  $H_2$ . The Pd element is charged with  $H_2$  by making it the cathode in an electrolytic cell and the amt. absorbed is calcd. from its elec. resistance by an empirical formula (Fischer, *Ann. Physik* 20, 503(1906)). The current flows from the pure Pd to the hydrogenated Pd at the hot junction. For a given concn. of  $H_2$ , the e. m. f. is proportional to the temp. difference up to differences of  $70^\circ$ . With a temp. difference of  $100^\circ$  the e. m. f. is proportional to the amt. of  $H_2$  present up to about 600 parts by vol., above which the e. m. f. seems to approach a const. value asymptotically. For 900 parts by vol. of  $H_2$  the value of the e. m. f. is 1.7 millivolts for  $100^\circ$  temp. difference.

J. A. ALMQUIST

**Electrical conductivity of some gold-iron alloys.** (Example of the electrical behavior of definite mixed-crystal series.) W. GUERTLER AND A. SCHULZE. *Z. physik. Chem.* 104, 90–100(1923).—The purpose is to study the elec. behavior of alloys of definite miscibility and the validity of Matthiessen's law. Measurements of the cond. of Fe and Fe-Au alloys contg. 1, 3, 5, 10, 20 and 40% Au were made at a no. of temps. between  $0^\circ$  and  $200^\circ$ . The change in the resistance ( $W$ ) of an alloy with temp. is given by the expression  $dW/dt = A(1 + Bt)$ , where  $A$  and  $B$  are consts. The consts.  $A$  and  $B$  increase from 0.00068 and 0.00128, resp., for 0% Au to 0.00066 and 0.00200 for 40% Au. The results of the investigation indicate that Matthiessen's law is best expressed as follows: Within a definite region of resistance the temp. coeff. of resistance for a binary alloy increases proportionally to the vol. concn. of the components.

H. JERMAIN CREIGHTON

**Discharge process in gases with the use of Tesla currents.** HERBERT FISCHER.

*Z. physik. Chem.* **104**, 74-89(1923).—Air, O, N, H and A all exhibit characteristic luminous phenomena in a discharge tube. The color differences observed with H are especially remarkable. In parallel expts. with O and air,  $O_2$  is invariably produced with a Tesla current or a low-frequency current of 9200 v. The  $O_2$  concn. increases approx. proportionally to the energy of the current, and rapidly diminishes as the distance between the electrodes increases. The  $O_2$  concn. also increases as the flow of gas through the tube becomes smaller and *vice versa*. Glass and Al ozonizers of the same dimensions yield approx. the same concn. of  $O_3$  under the same exptl. conditions; but ozonizers with a brass electrode produce very small quantities of  $O_3$ . With a Tesla current discharge the electrodes become quite warm, and cooling is necessary. Discharge through air produces small quantities of the anhydride of  $HNO_3$  but none of that of  $HNO_2$ . In O-N mixts. the  $O_3$  concn. increases with the content of O. The concn. of nitrous gases formed increases rapidly as the flow of gas decreases and *vice versa*.

H. JERMAIN CREIGHTON

**Voltaic cells of Vasilescu Karpen and the Nernst theory.** TH. IONESCO AND R. CERNATESCO. *Bull. sec. sci. acad. Roumaine* **8**, 55-68(1923); cf. Karpen, *C. A.* **17**, 670.—K. concluded that a cell composed of 2 immiscible liquids contg. a salt of a given metal and 2 electrodes of the same metal developed an e. m. f. and a current direction which were not in agreement with the Nernst osmotic theory, and that its action was unaccompanied by chem. reaction or change in concn. However, I. and C. obtained for  $Zn|N\ ZnSO_4$  the value and the current direction required by the Nernst theory, when they made single potential measurements and detd. directly the e. m. f. of the combinations  $Zn|amyl\ alc.|water|Zn$  and  $Zn|amyl\ alc.|N\ ZnSO_4|Zn$ . In the former the Zn in water is more electronegative, in the latter, the Zn in amyl alc. The direction of the current remains the same, however, because there is a p. d. between amyl alc. and  $N\ ZnSO_4$  while there is none between amyl alc. and water. The compn. of the 2 phases changes very slowly, but the diffusion is aided by heat. K. also constructed a cell, operating at 300-50°, composed of 2 Cu electrodes sepd. by mica strips, one of the electrodes having a cavity filled with  $CuSO_4$  soln. He considered this cell analogous to those composed of 2 immiscible liquids. I. and C. question this analogy, pointing out that the quantity of  $CuSO_4$  in the gas phase would be insufficient to render it conductive and to account for the e. m. f. (0.25 v.). They consider the case complicated by the possibility of a temp. difference between the electrodes; the fact that the mica might develop an e. m. f. under pressure, and that secondary reaction due to hydrolysis of the  $CuSO_4$  might affect the result.

A. C. PURDY

**Effect of fluorine on electrolytic oxidations.** A. RIUS Y MIRÓ. *Anales soc. españ. fis. quim.* **20**, 644-61(1922).—The electrolytic oxidation of chrome alum to  $K_2Cr_2O_7$ , or of  $K_2HPO_4$  to the perphosphate, is increased with increasing amts. of KF. It is supposed that the fluoride ions at the moment of their discharge at the anode react directly, or indirectly by means of  $O_2$  or a peroxide of Pt, with the electrolyte. The objections to this theory are discussed. The expts. were conducted on a very small scale, Pt electrodes being used.

L. E. GILSON

**The calibration of cells for conductance measurements. II. The intercomparison of cell constants.** H. C. PARKER. *J. Am. Chem. Soc.* **45**, 1366-79(1923); cf. *C. A.* **17**, 19.—An app. for the accurate intercomparison of cell consts. to extreme diln. is described. The curves obtained show the influence of polarization and indicate the presence of a newly discovered effect in the same direction in very dil. solns. The platinization and distribution of the electrodes influence the shape of these curves. The new effect is shown to amount to at least 0.33% for one type of electrode in general use. Its cause is ascribed to the presence of an adsorbed layer in contact with the electrodes, whose resistance is greater or less than the body of the soln. depending on the sign of the adsorption coeff. Its existence is supported by observations upon the change of the apparent resistance of a cell with voltage and frequency as well as by the results of other investigators.

H. C. PARKER

**Spectroscopic measurements of the hydrogen-ion concentration color changes in recent indicators.** T. T. BAKER AND L. F. DAVIDSON. *Phot. J.* **62**, 375-9(1922); *Science Abstracts* **26A**, 48.—The absorption curves are given of a no. of the newer indicators at their extreme ranges and in some cases in an intermediate color. Very slight changes in H-ion concn. often produce an extraordinary effect on the absorption. Thus, with bromocresol purple a minute trace of alkali completely changes the character of the ultra-violet absorption. The same is the case with bromothymol blue, with which an alkali in presence of a buffer salt produces only very slight intermediate changes.

H. G.

**The calculation of the electric moment of the molecule of a substance.** C. P.

SMYTH. *Phil. Mag.* [6] **45**, 849-63(1923).—The simple form of equation proposed by Debye to represent the temp. variation of the dielec. const. of a substance cannot be used to calc. the elec. moment from data upon the substance in the liquid state. A method is described whereby the elec. moment of a mol. in a liquid or gaseous substance may be calcd. from the  $n_s$  at two different wave lengths, the  $d$ . at one temp., the mol. diameter and certain universal const. For normal liquids results are obtained in good agreement with those from the method of Isnardi and Gans. For associated liquids it leads to results which are low but give an idea of the magnitude of the moment, while the method of I. and G. may lead to serious errors for associated liquids.

S. C. LIND  
The atomic refraction of mercury. M. TIFFENEAU AND CH. SOMMAIRE. *Bull. soc. chim.* **33**, 298-6(1923).—The following data were obtained: *Hg diethyl* (A),  $n_D^{20}$  1.504,  $d_{20}$  2.4268, mol. refraction 33.39; *Hg di-n-propyl* (B),  $n_D^{22}$  1.5138,  $d_{21}$  2.0111, mol. refraction 42.79; *Hg diisopropyl* (C),  $n_D^{23.6}$  1.52825,  $d_{23.5}$  2.0103, mol. refraction 43.82; *mercury di-n-butyl* (D),  $n_D^{21}$  1.5059,  $d_{21}$  1.790, mol. refraction 52.09. The mol. refraction was computed by the Lentz formula. The at. refraction for Hg was then obtained by subtracting the values for the at. refraction of the C and H atoms reported by Eisenlohr. This gives for the at. refraction of Hg in A 12.718, in B 12.882, difference + 0.164, and for D 12.946, difference + 0.064, conforming with the general rule that the at. refraction increases with the complexity of the radical, the increase becoming less with each addn. C gives an at. refraction for Hg of 13.910, greater by 1.028 than that for B.

F. L. BROWNE  
The optical properties of molten metals. A. K. ASTER. *Phys. Rev.* **20**, 349-57 (1922).—For molten Bi, Pb, Sn and Wood's alloy to 500° and Hg to 345° the optical properties are independent of temp.

E. H.  
Refractometric study of organic fluorine compounds. FRED SWARTS. *J. chim. phys.* **20**, 30-76(1923).—A large no. of org. F compds. have been studied to establish a refractometric const. for an element and to det. the influence of the structure of the mol. upon the additive properties. The compds. used were of the highest purity prepd. and purified as previously described (cf. *C. A.* **16**, 1421). A crit. review of the data and calcs. made by Eisenlohr and others (cf. *C. A.* **5**, 1218) leads to the conclusion that there is a refractometric const. for an element only for a detd. type of compd. and even then some reservation is necessary inasmuch as in a homologous series of normal hydrocarbons the const. for H increases with the length of the chain. The method used to det. the const. for F consists in comparing the mol. refraction ( $M$ ) (calcd. by the Lorentz formula) of the types AH and AX to find the value for the substitution  $H \rightarrow X$ . When Eykman's data for octane and dotriacontane were corrected to the exact mol. wts. the const. for  $CH_3$  was:  $H_\alpha = 4.618$ ;  $H_\beta = 4.688$ ;  $H_\gamma = 4.726$ ; and the const. for H was:  $H_\alpha = 1.079$ ;  $H_\beta = 1.093$ ;  $H_\gamma = 1.135$ . Substitution of F for H caused a decrease of  $M$  with the order of values  $C_8H_{18} > C_7H_{16} > C_3H_8$  and  $M_\gamma > M_\beta > M_\alpha$ , resp., for each hydrocarbon. The av. at. refraction for F calcd. by accepting the const. for H and subtracting the av. decrease caused by  $H \rightarrow X$  in the above 3 hydrocarbons was:  $F_\alpha = 0.989$ ;  $F_\beta = 0.973$  and  $F_\gamma = 1.005$ . *Aliphatic compds.*—There was no change in the at. refraction const. for each successive F substituted on the same C atom in difluoro- and trifluoromethylcyclohexane. The introduction of F into the Et group of EtOH and AcOEt decreased  $M$  in the same order as for the alkyl fluorides but the preexistence of an atom of F increased the refractometric const. of the second F. The value of  $M$  for  $F_2CHCH_2OH$  was practically the same as for EtOH but  $M$  for  $F_2CHCO_2Et$  was considerably greater than for AcOEt. Substitution of F in AcOH increased  $M$  and this effect increased with each successive F introduced. A similar increase of at. refraction for each successive F introduced was not found in amines. The variation of  $M$  for mixed alkyl halides caused by substitution of F was of the same order as in alkyl fluorides and the presence of the same number of Cl or Br atoms did not sensibly influence the depression of  $M$  caused by substituting F. The refractometric const. detd. for the group  $C = C$  was 6.512 (for  $H_\alpha$ ). The decrease of  $M$  for allyl, ethylene and ethyldene derivs. was greater than that for  $C_2H_2$  but this effect may not be due to any sp. influence of the double bond. *Aromatic compounds.*—All substituents ( $CH_3$ , Cl, Br, OH, OEt,  $NH_2$ ,  $CO_2Et$ , CN,  $NO_2$ ) in the benzene ring had a higher refractometric const. than in aliphatic compds. This increase was largest for  $NH_2$ ,  $CO_2Et$ , CN and  $NO_2$ . F was the only substituent whose refraction was less than in open-chain derivs. The reciprocal influence of 2 substituents was small. The depression of  $M$  was less for the  $m$ - than the  $o$ -position. Most  $p$ -derivs. increased  $M$ . The difference between  $M$  for the  $o$ - and  $p$ - was greatest in  $ClC_6H_4NO_2$ ,  $C_6H_4Cl_2$  and  $C_6H_4(NH_2)_2$ .



The refractometric const. for the second substituent Cl, CH<sub>3</sub>, OH, OEt or NH<sub>2</sub> was decreased but for NO<sub>2</sub>, CO<sub>2</sub>Et or CN was increased by the presence of F in C<sub>6</sub>H<sub>4</sub>F. Only a few trisubstituted and side-chain derivs. were studied. The results prove that the influence of the substitution of F extends to the entire mol. The electromagnetic modification thus brought to the entire mol. can lower the mol. dispersion so that the apparent value of  $H \rightarrow F$  may be negative. This important influence of the F atom on the other atoms of the mol. is evidently not sp. for F and ought to be found for other elements.

H. M. McLAUGHLIN

Velocity of sound in nitrogen peroxide. HERMANN SELLE. *Z. physik. Chem.* 104, 1-9(1923).—The velocity of sound in N<sub>2</sub>O<sub>4</sub> has been detd. by the Kundt method, and a sound dispersion established between the vibrations 3670 and 1609. With decreasing vibrations the value sank to about 3 m./sec. This sound dispersion is manifested at different temps. and pressures. The ratio  $\sqrt{\Delta p / \Delta \rho}$  (where  $p$  is the pressure and  $\rho$  the d. of the gas) has been detd. by a method similar to that of Clement and Desormes for the ratio of the sp. heats, and the velocity of sound calcd. for long vibrations. From the value obtained the dispersion is calcd. to be 4 m./sec. at 21° and 500 mm. pressure. From the relation between the velocity of sound and the reaction, N<sub>2</sub>O<sub>4</sub>  $\rightleftharpoons$  2NO<sub>2</sub>, the velocity consts.,  $k_1$  and  $k_2$ , are calcd. Between 18 and 26° the value for  $k_1$  increases from 376 to 617; the value of  $k_2$  (4.8.10<sup>4</sup>) is apparently independent of temp. At 21°, 4.4% of each mol. of N<sub>2</sub>O<sub>4</sub> decomposes to NO<sub>2</sub> in 10<sup>-4</sup> sec., or from each mol. of pure NO<sub>2</sub> 4.6% associates to N<sub>2</sub>O<sub>4</sub> in 10<sup>-8</sup> sec.

H. JERMAIN CREIGHTON

Fine and research chemicals. C. J. WEST. Nat. Research Council, *Reprint and Circular Series No. 44*, 45 pp.(1923); cf. *C. A.* 16, 195, 2633.—This is the second revision. It contains lists of American manufacturers, and of research chemicals, of biol. stains and indicators, of vital stains and of H-ion indicators that can be purchased in this country.

E. H.

Ostwald's color theory. ISMAR GINSBERG. *Color Trade J.* 11, 93-6(1922); *Textile World* 63, 2615-9, 2645(1923).—A discussion of the application of the theory.

CHAS. E. MULLIN

Color designation. HEINRICH TRILLICH. *Farben-Ztg.* 28, 1001-2(1923).—See also *C. A.* 17, 234.

F. A. WERTZ

Loss of color in objects exposed to light. SIDNEY F. HARMER. *J. Roy. Soc. Arts* 71, 144-53(1923).—In order that the best conditions for preserving the color of objects in museums might be detd., expts. were made involving exposures of 1030 days in 1914-17, and of 1485 days in 1917-21, on fugitive colors (chiefly synthetic derivs.). Max. fading was caused by direct sunlight; diffused sunlight was more harmful than elec. light. Tinted glasses varied in protective effect according to their relative power for absorbing violet and blue rays, but most of the glasses were not desirable because of the alteration in appearance of objects viewed in such light. Even the best glasses merely delayed fading; they did not prevent it. Pigments used with oil fade less rapidly than when employed as water colors. In museums the use of elec. light, rather than daylight, is to be preferred in order that the fading of objects may be delayed.

W. C. EBAUGH

Record of color research during 1922. A. E. BAWTREE. *J. Oil Colour Chem. Assoc.* 5, 353-6(1922).—A brief description of improvements made to the color circle used in the Bawtree colorimeter (cf. *C. A.* 16, 2065).

F. A. WERTZ

The fadeometer and measurement of fading. A. D. LANG. *J. Oil Colour Chem. Assoc.* 5, 356-61(1922).—A brief review of the value of artificial daylight for color matching, and of the C arc for detg. relative fastness of colors to light.

F. A. W.

Further experiments on the measurement of color. T. M. LOWRY and L. P. McHARTON. *J. Oil Colour Chem. Assoc.* 5, 351-3(1922).—The densities of a number of Lovibond glasses were previously measured (*C. A.* 16, 2065), and curves plotted to show the relationship between density and serial numbers of a complete series of glasses. These curves were almost linear, but when extended they cut the axis of 0 density at a point on the scale of numbers corresponding to -2 instead of 0. This has been found to be due to the fact that filters of equal density at the wave length of max. absorption of light, are not equal when examd. with white light.

F. A. W.

The lead content of Sung Dynasty Coinage (China). ANON. *Science (China)* 7, 839-41(1922).—Eight analyses of bronze coins of this period show a Pb content of 20-5%.

WM. H. ADOLPH

A few remarkable properties of gases (WÄCHTER) 3.

## 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

**General principle of relativity applied to the Rutherford-Bohr atom-model.** TH. WERREID. *Phys. Rev.* 21, 391-6(1923).—In this atom the possible electron orbits are detd. according to mechanical principles; then the actual orbits are selected by the quantum conditions. In computing the possible orbits, Bohr assumed classical mechanics, Sommerfeld applied the special theory of relativity with marked success, and now his assumptions are further generalized. In the expression for the world line element  $ds$  in polar coordinates, the potential functions  $\gamma$  and  $\gamma'$  are put equal to  $1 + (ak/r) + (bk^2/r^2) + \dots$  and  $1 + (a'k/r) + \dots$ , resp., where  $k/r$  is the ratio of potential energy to mass. The quantum assumptions are the same as Sommerfeld's with generalized  $ds$ , with an additional alternative assumption that the radial expression involves  $\gamma'$ . These lead to expressions for the energy in which all the consts. are known from exptl. results except  $B$  which Sommerfeld puts equal to  $1/4$  but which has not yet been exptl. detd. The method here used for the atom is the same as Riddington used for a macrocosmos.

NORRIS F. HALL

**An investigation of the structure of the halogen salts based on their compressibility.** IDA WOODWARD. *Phil. Mag.* 45, 882-95(1923).—Based on the cubical structure of the atoms and of the crystals which they form, the compressibility is calcd. for NaCl, NaBr, NaI, KCl, KBr, KI, AgCl and AgBr and compared with the exptl. values of Richards and Jones (*C. A.* 3, 975). The sp. induction capacity of NaCl and KCl were also calcd. The agreements of all calcd. and observed values is satisfactory.

S. C. LIND

**A few remarkable properties of gases.** FRIEDRICH WÄCHTER. *Z. anorg. allgem. Chem.* 121, 225-39(1922).—Evidence is offered that every gas (1) under certain circumstances is imponderable, (2) can cause the Lorentz contraction and (3) can assume an elasticity of form like substances in a solid state of aggregation, and emit a continuous spectrum with transverse light and heat waves of all lengths. These properties have hitherto been attributed only to the ether. If every weighable gas has these properties, the ether is probably an ordinary, ponderable, extremely light gas. If the atom of ether has the same mass as an electron or a  $\beta$ -particle and if the ether causes the Lorentz contraction like all gases, the expts. of Kaufmann (*Physik. Z.* 4, 54(1902); *Ann. Physik* 19, 487(1906)) and Bucherer (*Ann. Physik* 28, 513(1909); 29, 1063(1909)) are not proof of the apparent mass of the electron, but only of the Lorentz contraction in the ether. The assumption of electrons with apparent mass within atoms of chem. elements has no justification. If the conception of "electrons" or "atoms of electricity" is replaced by "atoms of the lightest ponderable gas of invariable mass," a simple representation of the inner at. structure is obtained. From the ordinary thermal velocity of atoms and mols. it can be calcd. that above  $500^\circ$ , light vibrations of 400-1000 billions must be emitted, though the mean velocity amounts to only a few hundred m. It is unnecessary to assume within atoms high velocities as did Bohr for the Rutherford atom.

C. C. DAVIS

**The mass-spectra of chemical elements. IV.** F. W. ASTON. *Phil. Mag.* 45, 934-45(1923); cf. *C. A.* 14, 3578; 15, 1451; 16, 1181.—Further expts. in the positive-ray examn. of the elements. 20-30 K. V. rays and an improved Schumannized photographic plate were used. No abnormalities were observed in Canadian Hg furnished by Prof. McLennan. An effort to detect  $\text{He}^{++}$ , which would be very close to  $\text{H}_2^+$ , was unsuccessful, probably because of the large field of action of  $\text{He}^{++}$  with an ionization potential of 80 v., enabling it to recapture an electron so readily that no  $\text{He}^{++}$  particles reached the plate. Measurements of Ni as  $\text{Ni}(\text{CO})_4$  disclosed 2 isotopes 58 and 60 with about the relative intensities to be expected from the at. wt. Expts. with metallic chlorides are discouraging on account of the large no. of lines owing to the attack on stopcock grease and formation of other volatile chlorides. Efforts to get a value for Pb by the use of  $\text{PbEt}_4$  failed, as likewise in the case of  $\text{ZnMe}_2$ . By use of a sample of Xe furnished from the original density detn. by R. B. Moore the two isotopes 128 and 130 were definitely established and two new ones 124 and 126 were rendered probable. By the use of  $\text{SnCl}_4$  tin was found to have isotopes 116, 117, 118, 119, 120, 122, 124 and possibly 121. While the Sn isotopes have wts. relatively integral among themselves, when compared with Xe the whole no. rule is departed from by 2-3 parts per 1000. Iron examd. by means of  $\text{Fe}(\text{CO})_5$  showed only one certain mass spectrum 56 and a possible 54. Efforts to det. Cd by volatilizing the metal in the app. failed, but it was observed that all Hg lines disappeared in the presence of the Cd mirror. This may be of future use. Efforts to det. Tl in presence of Cd to remove Hg proved unsuccessful.

By volatilizing selenium directly, 5 strong lines 76, 77, 78, 80, 82 and a faint 74 were obtained. The whole Se series recurs also at points 12 and 28 units higher, due to CSe and COSe. At least 3 of the Se isotopes 78, 80 and 82 are isobaric with those of Kr. Attempts with volatilized Te and with Be(AcO)<sub>2</sub> failed. Aluminum from AlCl<sub>3</sub> appears to be a simple element. Examn. of SbMe<sub>3</sub> shows antimony to have 2 isotopes 121 and 123, which by their intensities confirm the at. wt. value of Willard and McAlpine (C. A. 15, 1836).

S. C. LIND

Tracks of alpha particles in helium. D. M. BOSE and S. K. GHOSH. *Nature* 111, 463-4(1923).—Although previous photographs of  $\alpha$ -particle tracks in H never showed simultaneously the ionization trails of the two constituents of a H atom, photographs are here presented which show the tracks of the nucleus and the two bound electrons of He. There is also a photograph which seems to show the disintegration of a complex nucleus, 6 tracks of various types starting from the point of collision.

NORRIS F. HALL

Photographing the ionization tracks of the rest atoms of radioactive elements. D. M. BOSE and S. K. GHOSH. *Phil. Mag.* 45, 1050-4(1923).—A modification of the Wilson expansion app. for photographing the tracks of ionizing particles is described in connection with its use to detect the ionizing paths of the recoil or rest atoms upon the emission of an  $\alpha$ -particle by radon or by its decay products. Photographs of 6 tracks are shown, 5 of which appear to have the characteristics to be expected from Wertenstein's study of recoil atoms, including extensive scattering.

S. C. LIND

The theory of  $\delta$ -radiation. P. L. KAPITZA. *Phil. Mag.* 45, 989-98(1923).—A theory of the emission of  $\delta$ -radiation by  $\alpha$ -particles based on the assumption that the primary effect of the  $\alpha$ -particle in passing through matter is a thermal one. Since the path is definite and limited the local temp. may reach several thousand degrees for a short period of time.  $\delta$ -Radiation is then merely the thermionic emission due to this high temp. The hypothesis is supported by certain theoretical calcs.

S. C. L.

The quantitative estimation of radium by the emanation method. C. E. BAUMGARTEN and H. H. BARKER. *Ind. Eng. Chem.* 15, 597-9(1923).—A phosphoric acid method for the detn. of Ra by the emanation method is described. The method is similar to Barker's bisulfate method (C. A. 12, 1942). It is also shown that mixts. of HNO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub> and of HNO<sub>3</sub> and H<sub>3</sub>PO<sub>4</sub> may be used. B. prefers the H<sub>3</sub>PO<sub>4</sub> method.

L. D. R.

The use of normal radium and uranium solutions for emanation measurements. I. P. LUDWIG and E. LORENSER. *Z. Physik* 13, 284-91(1923).—Ampules contg.  $3.33 \times 10^{-4}$  g. Ra per cc. mixed with 0.033 g. Ba in HCl soln. furnished by the Technische Reichsanstalt and ampules contg. uranyl salts in HNO<sub>3</sub> and HCl with an emanation-equil. of  $14.68 \times 10^{-10}$  Curie were measured by L. and L. to ascertain the constancy of their emanation. The radium solns. agreed within 1% among one another and the U soln. within 0.5%. The temp. of the solns. during the transfer of the emanation is without effect. The age of the solns. did not affect the emanation values. (Cf. C. A. 17, 235.)

BENJAMIN S. NEUBAUSER

Separation of radium from other elements. U. CIALDEA. *Gazz. chim. ital.* 53, 42-8(1923).—This is an account of the recovery and purification of RaBr<sub>2</sub> accidentally spilled on a pavement and of the observations made in the process. The method used was an adaptation of the process used by Debiere in sepg. Ra from its ores.

E. J. WITZEMANN

Spark potentials in gases at elevated pressures and the molecular field. C. E. GUYE and J. J. WEIGLE. *Arch. sci. phys. nat.* 5, 19-36(1923); cf. C. A. 16, 384.—The uneven distribution of ions, which had been given by Guye and Mercier (C. A. 16, 2062) as the reason for the deviation of their results from Paschenals, has been explty. remedied. Small discrepancies still exist and, in a sequel, it is proposed to explain the deviations by assuming a mol. elec. field.

F. O. ANDERREGG

The discharge in dissociated gases. R. SEELIGER. *Z. Physik* 15, 27-30(1923).—Using Wood's explanation (C. A. 16, 4136) of the catalytic action of the glass walls in causing recombination of dissociated H and the poisoning action of O and H<sub>2</sub>O thereupon, S. explains the observation of Gehlhoff (*Ver. deut. physik. Ges.* 21, 350(1919)) that traces of O reduce the potential gradient of N very greatly. The observations of Neubert (C. A. 8, 1536, 2288, 2648) on striations and the two types of discharge in H are plausibly explained as caused by similar catalytic phenomena. These conceptions should be a help in studying the theory of the discharge tube including striations.

F. O. ANDERREGG

Experiments with radiometers. II. A new measurement of radiation pressure. WALTHER GERLACH and ALICE GOLSEN. *Z. Physik* 15, 1-7(1923).—The const. residual

throw of a radiometer in a vacuum was found to be proportional to the incident energy, to be independent of the wave length and in agreement with the theory. F. O. A.

**Some remarkable properties of gold layers produced by cathodic spluttering.** F. GROSS. *Z. Physik* 16, 40-5(1923); cf. C. A. 16, 1906.—Layers of gold were spluttered on to glass and quartz with a current of 10 milliamp. to a thickness of  $30-85 \times 10^{-7}$  cm. Under the microscope the layers on quartz showed numerous tiny drops or blisters of gold some of which looked like smooth and some like geared wheels. Layers on glass showed little blistering, and were reddish while those on quartz were yellowish. Those on quartz exhibited peculiar photoelec. properties. Layers on glass acted photoelectrically as if they were structureless. F. O. A.

**The emission of secondary electrons from nickel.** E. W. B. GILL. *Phil. Mag.* 45, 864-78(1923).—In a triode system consisting of a central axial hot filament, a cylindrical grid and an outer cylindrical Ni plate, the current curve between filament and plate as dependent on the + voltage  $V_p$  implied on the plate (with the grid voltage  $V_g$  fixed), has three distinct parts: (1) a rapidly ascending branch representing increase of plate current, (2) a descending branch as the secondary electron emission from the plate becomes greater and (3) another ascending branch reaching a const. level when  $V_p$  becomes equal to  $V_g$ . The shape of the curve has been interpreted by Horton and Davies (C. A. 14, 3361). G. has made new detns. and proposes an interpretation differing essentially from that of H. and D. No attempt is made to differentiate between reflected and true secondary electrons from the Ni plate. Much emphasis is laid on the oblique angles at which some electrons pass through the grid as affecting their subsequent curved paths, the voltage at which they will reach the plate and the resulting secondary emission. S. C. LIND.

**The effect of current on the photoelectric sensitivity of metals.** A. G. SHENSTONE. *Phil. Mag.* 45, 918-26(1923); cf. C. A. 16, 197.—The reality of the effect of current on the photoelec. emissivity of metals, previously observed for Bi(C. A. 15, 2782), has been confirmed for several other metals including Cu, Ni, Ag and Au. Films are formed on glass by first plating the resp. metals on W and distg. from the electrically heated W to the glass. To plate Ag on W it was first necessary to plate W with Ni. S. claims to have eliminated the possible effect of gases liberated by the heating effect of the current which has been stated by others to be the controlling factor. Curves are shown for slow and rapid increase of plate current, and for the reverse charge on cessation of the plate current. No satisfactory theory of the phenomenon has been arrived at. S. C. L.

**The variation of the photoelectric activity of a potassium ferrocyanide solution with the concentration of the solution.** J. H. J. POOLE. *Phil. Mag.* 45, 895-906(1923).—A Hg quartz lamp was used as source of radiation, the electrons were accelerated by a + Cu grid above the soln. in the usual way and the current was measured with an electrometer. The results indicated that the negative radical is responsible for the photoelec. properties of the soln. The relative increase of the activity of the stronger solns. cannot be accounted for either by the possible effects of the range of the photoelectron in the soln. or by the increase in the no. of undissociated mols. per cc. of soln. It is probable that this increase is to be attributed to the effect of a possible association of the mols. of the solute in the more concd. solns. S. C. L.

**Ionic oscillations in the striated glow discharge.** E. V. APPLETON AND A. G. D. WEST. *Phil. Mag.* 45, 879-81(1923).—In some expts. on the elec. properties of ionized gases for high frequencies it was found that the ordinary striated glow discharge frequently generates elec. waves which could be detected by ordinary wireless receiving devices. The discharge tube was a simple type with either hot or cold cathode. Discharge is started by an induction coil and maintained by a steady anode potential. The ionic oscillations have been detected (1) by a condenser of tin-foil plates attached to the outside of the discharge tube and also connected in parallel with the condenser of an auto-heterodyne receiver, (2) by an oscillatory circuit fitted up with a diode rectifier and galvanometer connected in series across the condenser and the whole placed close to the discharge tube, (3) by means of a diode valve and galvanometer paralleled with a capacity and with the discharge tube. At a particular capacity a large deflection was obtained. The frequencies were of the order 105 and the wave lengths 2000-4000 m. S. C. LIND.

**Cathodo-luminescence and its relation to states of molecular aggregation.** J. EWLES. *Phil. Mag.* 45, 957-68(1923).—Adopting the Wiedemann definition of luminescence as the re-emission in the form of light of any absorbed energy, E. reviews systematically the work of others and then describes a form of app. in which solids can be exposed on a strip of Pt foil to a stream of cathode rays under known conditions of voltage and temp. It is shown for about 20 substances that each has a characteristic

min. voltage of excitation below which it does not luminesce. The highest value was 5200 v. for  $\text{WO}_3$ , the lowest ones 580-650 for  $\text{Al}_2\text{O}_3$ , 750 for  $\text{SiO}_2$ , 700 for  $\text{BaO}$ , 950 for  $\text{CaS}$ , 1200 for  $\text{ZrO}$ . The values are characteristic not only of the given substance but of a particular state of aggregation and in all of 14 substances examd. the temp. at which cathodoluminescence disappears is characterized by a transition point to a different mol. state. A theory of luminescence in connection with the well known effect of impurities is suggested. S. C. LIND

The energy distribution at the cathode in the glow discharge. A. GÜNTHER-SCHULZE. *Z. Physik* 15, 8-23 (1923).—The old idea of a cold Crookes dark space with perhaps 25 collisions by a cation in N requires that not more than 20% of the cathode-drop energy be carried to the cathode. But on heating a calibrated iron sphere cathode in the discharge through A at 1.83 mm. 72%, and through H at 2.37 mm. 37%, of the cathode-drop energy was found to be carried to the cathode. Measurements of the resistance of a Pt-foil cathode in N and H gave similar results rising from 27 to 70% with the pressure. In agreement with studies at higher voltage it is concluded that some of the cations must pass through the cathode-drop region without collision. As a result the dark space must reach a temp. as high as  $720^\circ$  and the free paths must be very short. The electrons usually pass through the cathode-drop without collision and produce ionization only in the dark space where the conditions are most favorable. With a normal cathode drop, therefore, the ratio of electron current to cation current at the cathode is thought to be 1 : 10. The temp. of the cathode and cathode-drop regions often rises to  $1000^\circ$ . F. O. ANDEREGG

Secondary radiations produced by X-rays and some of their applications to physical problems. A. H. COMPTON. *Bull. Nat. Res. Council* 4, Pt. 2, 1-56 (1923).—This monograph deals with (1) secondary X-rays, the scattering and fluorescence of X-rays; (2) photoelectrons excited by X-rays; (3) absorption and (4) refraction of X-rays, and (5) some applications of secondary X-rays to investigations on the nature of radiation and the structure of matter. W. F. MEGGERS

Spectral series and ionization and resonance potentials of chromium and molybdenum. M. A. CATALAN. *Compt. rend.* 176, 1063-5 (1923).—An earlier communication (C. A. 17, 1586) gave two parallel systems of series of triplets in the Cr arc spectrum and in a second note (C. A. 17, 1589) a system of triplet series for Mo was announced. Now a second system of triplet series parallel to the above mentioned system for Mo is presented and one example of a *multi-triplet* is given. By means of the  $1s$  term, 54640.9 and 57420.4 for Cr and Mo, resp., the ionization potentials for these elements are found to have the values 6.7 and 7.1 v. The first resonance potentials, calcd. from the triplets  $\lambda$  4254, 4276, 4290 and  $\lambda$  3798, 3864, 3902 are, resp., 2.89 and 3.19 v. for Cr and Mo. W. F. MEGGERS

The band spectra and the electronic configuration of nitrogen and carbon monoxide molecules. HANTARO NAGAOKA. *Proc. Physico-Math. Soc. Japan* 5, 35-43 (1923).—The remarkable coincidences of various phys. properties of  $\text{N}_2$  and CO are thought to be due to the similarity in the electronic configuration of the mols. of these two gases. Since the chem. and phys. properties are detd. largely by the outer electrons and these external electrons are involved also in the production of spectra, it may be expected that coincidences of the band spectra of  $\text{N}_2$  and CO will occur. Such is actually the case and four tables of wave lengths are given to illustrate the approx. correspondence. In some cases CO band heads are closely matched by  $\text{N}_2$  band heads, in others a single head of one corresponds to the means of two or more lines in the other, while in one table coincidences of CO bands with the *line spectrum* of N is presented although the cause of coincidences between different types of spectra is not clear. The resemblance between the band spectra indicates a similarity in the electron arrangement in  $\text{N}_2$  and CO mols.; it further endorses what has been obtained in measurements of the phys. consts. of these two gases. W. F. MEGGERS

Structure of the hydrogen lines  $H_\alpha$  and  $H_\beta$ . A. E. M. GEDDES. *Proc. Roy. Soc. Edinburgh* 43, 37-42 (1922).—According to Sommerfeld's theory of the fine structure of spectral lines, the sepn. of the doublets for all the members of the Balmer series of H should be const. and have a value of  $0.365 \text{ cm}^{-1}$ . The results obtained by Gehrecke and Lau and by McLennan and Lowe show a decrease in this sepn. from  $H_\alpha$  to  $H_\beta$ . In the present investigation the first two lines of the Balmer series were studied with an echelon grating of 33 plates. The spectrum was produced by induction coil excitation of H in a quartz tube whose capillary portion was 5 cm. long. To sharpen the lines this portion of the tube was surrounded by solid  $\text{CO}_2$  and ether. Measurements were made from photographs and also visually in the case of  $H_\alpha$ . The frequency differences were found to be  $0.34 \text{ cm}^{-1}$  for  $H_\alpha$  and  $0.33 \text{ cm}^{-1}$  for  $H_\beta$ . This is thought to indicate that

the sepn. decrease, probably becoming zero at the limit of the series, and suggests that the fine-structure theory of spectral lines as given by Sommerfeld must be incomplete.

W. F. MEGGERS

**Tesla-luminescence spectra. I. The form of apparatus and the spectrum of benzene.** WM. H. MCVICKER, J. K. MARSH AND A. W. STEWART. *J. Chem. Soc.* 123, 642-54(1923).—To distinguish fluorescence and absorption spectra from those produced by the Tesla discharge a new name, Tesla-luminescence, is applied to the latter. The vapor to be examd. was placed in a glass tube having a quartz window at one end and was excited by the discharge from a Tesla transformer with primary connected with a large spark coil. The luminescence thus produced was photographed with a quartz spectrograph and the wave lengths of bands were detd. with a probable error of 1 to 5 Å. At ordinary pressure and its b. p. aniline emits a short continuous spectrum, while benzene shows only a fragmentary C spectrum. On reducing the pressure to 65 mm., benzene emits an ultra-violet spectrum contg. a regular series of band-groups designated by the letters A to F, each group having the same internal structure as the others. When the bands of the fluorescence spectrum of benzene in alc. solution are compared with the Tesla-luminescence spectrum a close correspondence is apparent if the former spectrum be shifted slightly toward the ultra-violet. Comparison with the absorption bands observed by Hartley in benzene vapor shows that the Tesla-luminescence presents an emission corresponding exactly to the absorption spectrum. Thus for the first time the Fraunhofer effect in the case of a complex org. compd. of known constitution, is exhibited. The whole series of wave-nos. for the six primary series of Tesla-luminescence bands can be expressed by a simple empirical formula,  $\nu = 16452/l$  where  $l$  is an integer belonging to the series 194, 195 . . . 228. The strongest of these bands is calcd. with  $l = 6^3$  and when  $l$  is given the values  $6^3$  and 6 bands are computed which coincide with some actually recorded in the infra-red region. II. **The effect of varying temperature and pressure on the benzene spectrum.** WM. H. MCVICKER AND J. K. MARSH. *Ibid* 817-20.—An emission spectrum of  $C_6H_6$  excited by a high-frequency elec. discharge was previously described (cf. above). Varying conditions of temp. and pressure are found to produce some changes in the spectrum. At a lower pressure, 1.6 mm., two additional series of bands, designated by letters G and H, are observed which do not conform to the type previously recorded, but correspond, to bands observed by Henri (*C. A.* 16, 3590) in the absorption spectrum of benzene. Spectral variations are observed over a range of pressures from 1.6 mm. to 22 cm. and at  $15^\circ$  and  $150^\circ$  at const. pressure and also at const. vol. At high pressures or temps. the spectrum becomes less intense, more diffuse and the shorter wave-length bands vanish. It is seen that the Tesla-luminescence spectrum of  $C_6H_6$  is characteristic and persists over a large range of exptl. conditions. Complete disruption of the  $C_6H_6$  mol., which would be quickly brought about by an ordinary high potential discharge, is entirely avoided at low pressures by the Tesla discharge.

W. F. MEGGERS

**The fluorescence spectrum of benzene vapor.** WM. H. MCVICKER AND J. K. MARSH. *J. Chem. Soc.* 123, 820-2(1923).—Observations on the fluorescence spectrum of solns. of  $C_6H_6$  are somewhat discordant and attempts to detect any fluorescence from  $C_6H_6$  vapor have heretofore been unsuccessful. In this expt.  $C_6H_6$  vapor at 3 cm. Hg pressure contained in a silica tube 10 cm. long by 2 cm. diam. was illuminated from one side by an Fe spark or arc while one end of the tube was placed about 2 cm. in front of the slit of a quartz spectrograph. An exposure of 100 min. gave a thin negative showing, however, more than 30 fluorescence bands. Alongside on the same plate the Tesla-luminescence spectrum of  $C_6H_6$  (cf. preceding abstracts) was recorded. The two spectra are alike in structure but differ much in intensity, the elec. excitation producing by far the brighter spectrum. It is suggested that the Tesla-luminescence spectra open a new field of investigation in mol. spectra.

W. F. MEGGERS

**Spark spectra of higher order.** LÉON AND EUGÈNE BLOCH. *Compt. rend.* 176, 1062-3(1923).—Reassertion of the claim that the method of exciting several categories of spark spectra with a high frequency discharge in an electrodeless tube is new, in answer to Dunoyer's claim of priority based on his studies of induction spectra.

C. C. KIESS

**Induction spectra and spark spectra.** L. DUNOYER. *Compt. rend.* 176, 1213-4(1923).—Reply to L. and E. Bloch (preceding abstract).

C. C. KIESS

**Series of multiple lines with fourfold Rydberg constant in the spectrum of potassium.** K. A. NISSEN. *Astrophys. J.* 57, 185-90(1923).—Analysis of the lines measured by McLennan, Schillinger, and Nelthorpe in the "ground spectrum" of K has led to the discovery of one diffuse series  $2p \rightarrow md$ , and of several sharp series, namely,  $2p_x \rightarrow ms'$ ,  $2p_y \rightarrow ms'$ ,  $2p_z \rightarrow ms''$ ,  $2p_x \rightarrow ms'$ , and  $2p_z \rightarrow ms''$ . Sixty-four lines between wave

lengths 1873 Å. and 4608 Å. are thus accounted for. The series are accurately represented by Ritz formulas in which  $4N$  replaces the Rydberg const. The results are in harmony with the theory that the spark spectrum of an alkali has the same structure as the arc spectrum of the inert gas with at. no. one less. C. C. KIESS

**The production of narrow and broad bands in the absorption spectrum of a substance in solution and in the gaseous state.** VICTOR HENRI. *Compt. rend.* 176, 1142-5(1923).—Absorption spectra of various compds. in soln. or in the gaseous state exhibit either narrow bands distributed in regular series, or broad continuous bands. Some solns. exhibit both types of absorption, in which case the broad bands always lie toward shorter wave lengths from the narrow bands, a fact analogous to the emission of metallic vapors, the continuous spectrum lying to the violet of the convergence frequency of the spectral series. The quantum theory affords a satisfactory explanation of the narrow bands; but as yet the occurrence of the broad bands has not been explained. Comparative studies of a large no. of different compds. has shown: (1) Substances whose mols. contain a single double bond, as  $C=C$ ,  $C=O$ , etc., exhibit only broad bands whether in soln. or as a vapor; (2) substances whose mols. are as simple as possible and contain several double bonds, as  $H_3C-C=O$ , etc., exhibit series of narrow absorption bands in solns. and as vapors; (3) when in a mol. of the previous type the group  $CH_3$  is introduced, the narrow bands fuse and only broad bands are observed; (4) if a mol. becomes more complex by the addition of at. groups then the spectrum changes from one of narrow bands to one of broad continuous bands. These facts lead to the theory that there exists a polarity in the mols.; and that the reciprocal vibrations of groups of opposite polarity will present a series of stationary states. Whatever separates the charges in the mol. from each other or neutralizes them will suppress the condition for the quantic movements. Consequently a broad absorption band will take the place of the narrow bands. C. C. KIESS

**The existence of new lines—doublets of the Sommerfeld type, excluded by the selection principle—in the L series of the heavy elements.** PIERRE AUGER AND A. DAUVILLIER. *Compt. rend.* 176, 1297-8(1923).—Among the combinations ML which produce the lower frequency members of the L series in the X-ray spectra of the elements are certain feeble lines  $\beta_a$ ,  $\beta_b$ , and  $\beta_{11}$ , which should be excluded by the selection principle. However, observation of the spectra of Ta, W, Os, Ir, Pt, Au, and U shows for each the existence of the combination lines  $M_4L_1$  and  $M_3L_1$ , whose wave lengths in X units are given, which correspond to a variation of zero in the azimuthal quantum no. The line  $M_4L_1$  forms a doublet of the Sommerfeld type with  $\beta_{11}$ . In addition to the above new lines there are given the wave lengths of 25 lines of the L series of Ta and 4 lines of the K series of Ru. C. C. KIESS

**The ultra-violet absorption spectrum of chlorobenzene. Determination of the structure of the molecule.** VICTOR HENRI. *Compt. rend.* 176, 1298-1301(1923).—More than 750 bands were measured in the absorption spectrum of chlorobenzene between 2755 Å. and 2262 Å., the vapor being 100 cm. thick at a pressure of 3 mm. The bands fall into 8 groups, each group consisting of several series of the first order, and each of these of series of the second order. Quantizing the motions of the electrons, the atoms, and the mol. leads to a formula which represents fairly accurately the distribution of the bands. The mol. model suggested by the formula is that of an oblate octahedron, the group CCl having its center of gravity about 0.4 Å. distant from the median plane which passes through the four groups  $CH$ , and the apex opposite  $CH$  being 0.8 Å. from the same plane. C. C. KIESS

**The complex anisotropic molecule in relation to the theory of dispersion and scattering of light in gases and liquids.** L. V. KING. *Nature* 111, 667(1923).—The theory already developed in terms of a simple anisotropic mol. for the character of the light scattered by various gases in a direction at right angles to the incident beam has been extended to gaseous and liquid media composed of complex anisotropic mols., and formulas have been derived for the scattering in each. That for liquids, including the hypothesis that they have an extremely fine grain cryst. structure, accounts for the relative scattering of 20 org. liquids. G. R. FONDA

**Phosphorescence on the Röntgen screen.** B. GUDDEN AND R. POHL. *Naturwissenschaften* 11, 340(1923).—Phosphorescence similar to that on a ZnS screen in an elec. field (cf. C. A. 14, 3363) was observed with an "Astral" Röntgen screen. The screen was made a dielec. in a condenser with a transparent plate, by placing the screen on a metal plate and on the screen a plane glass cell filled with  $H_2O$ . The elec. field was excited by an influence machine, Leyden jar or transformer. When the screen was previously exposed to X-rays or ultra-violet light with wave length  $< 280 \mu\mu$ , phosphorescence appeared in the elec. field. The screen remained dark if it was heated after ex-

posure but before placing in the field. Phosphorescence was also produced by the approach of an electrified sealing-wax rod, by rubbing with a dry finger or glove or by an air current.

C. C. DAVIS

**Study of absorption in the ultra-violet of a series of camphor derivatives.** A. HALDER AND R. LUCAS. *Compt. rend.* 176, 45-9(1923).—Several derivs. of camphor were dissolved in  $C_6H_5OH$  and photographs of the absorption spectrum for different thicknesses of soln. were made. The log of the thickness was plotted against the log

of the wave length in Å. U. All compds. of the type  $C_{10}H_{16}$   $\begin{array}{c} \diagup \\ C = CH - R \\ \diagdown \\ CO \end{array}$  have a

strong absorption band, the max. varying for each of the compds. from 2900 to 3500 Å. U. providing benzyl or anisyl camphor is absent. The heavier the radical the further is the max. displaced toward the red end of the spectrum. The absorption band is due to the double bond.

HARRY B. WEISER

**The emission of light by canal rays.** W. WIEN. *Ann. Physik* 70, 1-31(1923).—A theory is developed for the emission of light by canal rays by statistical methods which are simplified by the consideration that the canal rays move only in one direction. The effect of collisions is handled by the introduction of the mean free path as in the kinetic theory of gases, for the case of atoms colliding with mols. at rest. The theory is restricted to the case where the light is emitted by uncharged atoms as in the Balmer series of H. Expressions are derived for the no. of positively charged atoms which are not emitting, for the uncharged atoms which are not sufficiently excited to emit and for the neutral atoms emitting light. These expressions are discussed for the case when the canal rays pass suddenly from a space of one pressure to another. The expressions are simplified by the exptl. fact that the mean free path in each of these regions is inversely proportional to the pressure. On the other hand the mean free path of an uncharged atom between the excited and the unexcited condition is independent of the pressure. By considering the no. of atoms excited to emission in an infinitesimal element of the path of the canal rays and by introducing Planck's quantum of energy  $h\nu$  an expression is developed for the intensity of the light as a function of the mean free path. When the canal rays pass suddenly from a place of high pressure into a vacuum, the intensity is an exponential function of the distance travelled by the atom between the excited and the unexcited conditions. An exptl. verification of this is made for the case when the canal rays pass from a region of one definite pressure to a different pressure. The canal rays produced in H were passed into a space filled with either H or N. Observations were made at different pressures for two lines in the spectrum of H. The theory satisfactorily accounts for the observed facts. For higher pressures it was necessary to modify the method of making the observations. A comparison of the observed with the theoretical curves enables the calcul. of the mean free path between the excited and the unexcited conditions of the atom. For these pressures it is a function of the pressure.

A. W. S.

**The meaning of complex spectra by the method of internal quantum numbers.** A. SOMMERFELD. *Ann. Physik* 70, 32-62(1923).—The ideas previously developed by S. are extended to the spectra of Mn and Cr. By means of internal quantum nos. it is possible to account for the appearance of certain combinations of lines and the absence of other combinations in spectra. The azimuthal quantum no. characterizes the series to which the lines belong. The total quantum no. det. the lines in the series. The internal quantum no. gives the no. of parts into which a term may be divided as doublets, triplets, etc. The internal quantum no. is assumed to change by  $\pm 1$  or 0 and the total quantum no. by  $\pm 1$ . In the spectra of the alkalis and the alk. earths the max. value of the internal quantum no. corresponds to the value of the total quantum no. The difference between the internal quantum nos. and not their abs. values are of interest. This idea of internal quantum no. is an empirical plan to represent the facts but it has found some theoretical basis in the work of Landé and von Heisenberg in their study of the combination of single and triple terms for sharp, principal and diffuse series. They assume that the internal quantum no. can change only by  $\pm 1$ . The intensities of those lines are greatest in which the internal quantum no. and the total quantum no. change in the same direction. Götze has shown that this rule explains the intensities of the terms in the spectrum of Sr and Ca. In Mn the intensities of all the lines are about the same. A no. of alternative schemes for the explanation of the complex lines in terms of these 3 quantum nos. are given. An application of the theory is also made to det. the magnetic moment of paramagnetic substances. This spectroscopic evidence indicates that there are 3 Bohr magnetons in the neutral, unexcited Mn atom and that there are 2 Bohr magnetons in the neutral, unexcited Cr atom.

A. W. S.



**Quantum theory of photographic exposure.** III. L. SILBERSTEIN. *Phil. Mag.* 45, 1062-70(1923).—A further development of the quantum theory of photographic exposure (*C. A.* 16, 3441; 17, 498) using the concept of light "darts." In the first part the abs. energy values of the exposures used in the two preceding papers are given. They enable the calcn. of  $\epsilon$ , the effective fractional area of the grains. A surprisingly small value,  $1.2 \times 10^{-3}$ , is obtained. Though other hypotheses are entertained, the original interpretation of the sensitive spots is retained. In the second part a very simple formula for photographic "density" is deduced:  $D = 2 \log (1 + \alpha E)$ , where  $E$  is the time of exposure and  $\alpha$  is a const., 0.151 in the case of the X-ray exposures by means of which the equation was tested. The agreements of  $D$  observed with the calcd. values are very satisfactory from 1 up to 32 and even to  $32\sqrt{2}$  times  $E$  in arbitrary units.

S. C. LIND

**Application of the quantum theory to photochemical sensitizing.** K. F. BONHOEFFER. *Z. Physik* 13, 94-105(1923).—The decompn. of  $\text{COBr}_2$  is sensitized through Br, but the rapid rate in the dark makes it difficult to get quant. results. The decompn. of  $\text{O}_3$  by means of light falling on Cl has been very carefully studied. The Einstein equivalency law holds, one quantum bringing about the decompn. of two mols. of  $\text{O}_3$ . Because of the const. light absorption of the sensitizer Cl, the decompn. rate is almost independent of the Cl concn. to very small concns. If the diameter of the Cl<sub>2</sub> mol. can be calcd. from the kinetic theory the life of the excited Cl<sub>2</sub> is shown to be at least  $10^{-7}$  sec. The decompn. of  $\text{COCl}_2$  and the combination of  $\text{SO}_2$  and  $\text{Cl}_2$  go many times as fast as the Einstein law would allow.

F. O. ANDEREGG

Mendeleeffite, a new radioactive mineral (VERNADSKII) 8.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

**Recent electric-furnace developments.** E. T. MOORE. *Blast Furnace Steel Plant* 11, 153-8(1923); cf. *C. A.* 16, 22, 686.—A total of 416 elec. furnaces had been installed or contracted for in the U. S. up to Dec. 1, 1922. There was a tendency toward the use of a greater no. of small furnaces. No appreciable interest in elec. furnaces was indicated among gray or malleable Fe foundries. An installation was made in England for melting and partly refining steel in a 10-ton furnace and then transferring approx.  $\frac{1}{4}$  of the molten bath to a  $3\frac{1}{4}$ -ton furnace for finishing. Several elec. and metallurgical advantages are claimed. The same practice has been tried in this country with satisfactory results. The largest elec. arc furnace thus far installed is a 60-ton Greaves-Etchells furnace. This furnace has 2 charging doors on each side, 1 in the rear, and a teeming spout in the front. All doors are operated by air cylinders. Side-wall linings are 18 in. thick; roof brick 12 in. thick. There are eight 24-in. carbon electrodes. Transformer equipment consists of four 3,000 kv. a. units, primary 4600 v., secondary 90 to 39 v. Among other developments in the general field, the need for improved electrodes has been met by at least one manufacturer by making electrodes of considerably higher density. Reports indicate better performance and less breakage with such electrodes.

LOUIS JORDAN

**The Brown-Boveri electric furnace for melting metals.** DUMARTIN. *Revue BBC*, Oct. 1922; *Rev. métal.* 20(Extraits), 206-10(1923).—A description of the furnace with a brief discussion of its merits.

A. PAPINEAU-COUTURE

**High-frequency induction electric furnaces.** G. RIBAUD. *Technique moderne* 15, 225-31(1923).—A review with bibliography.

A. PAPINEAU-COUTURE

**Electric heating by ironless induction.** E. F. NORTHRUP. *Gen. Elec. Rev.* 25, 656-65(1922).—A consideration of the fundamental principles which apply in heating inductively with currents of frequencies sufficiently high to make the use of Fe unnecessary for increasing magnetic induction. The early development of high-frequency heating was based on the use of an oscillatory discharge from a bank of static condensers. With such an arrangement no heating of the conducting mass (the furnace charge) is taking place while the condensers are charging. A source which yields high-frequency current continuously and of uniform magnitude makes the inductive heating continuous and permits equal rates of heating with lower peak voltage at the terminals of the inductor coil and consequently allows more simple elec. insulation in the coil. With a current of 20,000 cycles it is possible to heat a vol. of  $\frac{1}{8}$  cu. ft. to 2,500° or higher with a power input of 12 kw. Moderate frequencies, as 480 cycles, are probably entirely

suitable for heating steel to 300° to 400° with high thermal efficiency and com. economy. Induction heating without the use of Fe and with currents obtained directly from com. supply circuits is inefficient and wholly impracticable. High-frequency power required for this type of heating may be derived from 3 classes of app.: (1) for 480 to 700 cycles an alternator driven directly by a motor; (2) for 5,000 to 50,000 cycles in power units not exceeding 70 kw. a converter consisting of a non-vacuum Hg discharge gap and banks of static condensers; (3) for 10,000 to 30,000 cycles in larger power units, static high-frequency converters employing vacuum bulbs as used for radio work. The current from this source is continuous and of sine wave form. It is expected that app. of this type will solve the problem of the com. application of high-frequency inductive heating to requirements calling for high temp. and large amts. of power. LOUIS JORDAN

**The preparation of barium alloys.** V. M. GOLDSCHMIDT. *Norg. Geol. Undersökelse, Statens Raastofkomite Publication* No. 7, 1922, 36 pp.—Alloys of Ba with Pb have been prep'd. by electrolysis of fused  $\text{BaCl}_2\text{-NaCl-KCl}$  in a cell with molten Pb as the cathode. With an electrolyte contg. 8 parts  $\text{BaCl}_2$ , 5 parts KCl and 3 parts NaCl, Ba-Pb alloys were prep'd. which contained 18% Ba and less than 1% of Na. A C anode was used. The prep'n. of a 10% Ba-Pb alloy from the above electrolyte at 600–50° requires an e. m. f. of 4–6 with the electrodes 1–1.5 cm. apart. The c. d. should not exceed 3 amp. per  $\text{cm}^2$  at the anode nor 1 amp. at the cathode. Alloys of Ba with Zn and Sn, of low Ba content, have also been prep'd. The tech. prep'n. of Ba-Pb alloys is described as well as methods for their analysis. J. A. ALMQUIST

**The arc process for the manufacture of oxides of nitrogen.** G. COURTOIS. *Mém. compl. rend. trav. soc. ing. civils* 8, 313–9 (1922); *Chimie et industrie* 9, 729 (1923).—C. suggests improving the process from an economical standpoint by using the hot gases for generating steam. The amt. of steam which can be generated per kw.-yr. is equal to that produced by 1 ton of fuel of av. quality. A. PAPINEAU-COUTURE

**The electrolytic production of acid and alkali from sodium sulfate solutions.** H. V. ATWELL AND TYLER FUWA. *Ind. Eng. Chem.* 15, 617–20 (1923).—A summary of results on the electrolysis of waste  $\text{Na}_2\text{SO}_4$  solns. aiming at the commercial production for local consumption of NaOH and  $\text{H}_2\text{SO}_4$ . Production cost of NaOH compares favorably with that from NaCl and there is saving of the cost of raw material. The value of the anode products,  $\text{H}_2\text{SO}_4$  and O, is, however, less than that of Cl from the salt process. W. H. BOYNTON

**Direct conversion of fuel energy into electric energy.** GÖSTA ANGEL. *Teknisk Tids.* 53, 13–20 (1923).—An address summarizing the literature. A. R. ROSE

**Electrical characteristics and testing of dry cells.** ANON. *Bur. Standards, Circ. No. 79* (2nd edition), 1923.—This circular summarizes the available information on dry cells. A brief description of the materials and methods of construction, and elementary theory of the operation of the cells is given. The elec. characteristics of the cells and methods of testing them are discussed. In an appendix are given specifications for dry cells which have been prep'd. by the Bureau with the coöperation of the mfrs. and principal users of dry cells. M. KNOBEL

**Luminous discharge amplifying (radio) tubes.** ERICH MARX. *Ann. Physik* 70, 257–82 (1923).—Tubes are described which do not require a heated cathode. The cathode is made of K or K-Pb alloy contg. 5% K. The tubes contain He or Ar. Ne was tried without success. The tube requires 5 electrodes and is in only an exptl. stage. D. MACRAE

**Dielectric research. Variation of dielectric constant with frequency and energy loss in standard dielectrics.** JAMES MOULD. *Beama* 12, 337–44 (1923). C. G. F.

**Discharge process in gases with the use of Tesla currents (FISCHER) 2.** Effect of F on electrolytic oxidations (RÍFUS Y MIRO) 2.

**Storage battery.** B. B. BLACKBURN. U. S. 1,456,420, May 22. Structural features.

**Storage battery.** R. B. OWEN. U. S. 1,456,565, May 29. "Paramold" is used for the manuf. of molded containers for storage batteries.

**Carbon electrodes.** S. E. SHURIN. U. S. 1,456,495, May 22. Electrodes molded from C powder and tar are heated in closed containers and the escaping tar gases are led from the containers and condensed and, after escape of these gases, the electrode bodies are removed from the containers and given a finishing burning.

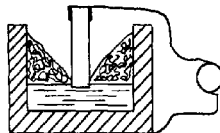
**Increasing the lifetime of electrodes.** NORSK HYDRO-ELEKTRISK KVAELATOFAKTIESKESKAP. Norw. 35,014, June 12, 1922. In elec. furnaces the arc has a tendency

to stick to the electrodes at places of air-diln. or rather places where the air stands still. The gas current is applied in a way so as to counteract this phenomenon.

**Electrolytic condenser.** J. SLEPIAN. U. S. 1,456,941, May 29. Structural features of condenser cells or lightning arresters.

**Electrolytic condenser apparatus.** R. D. MERSHON. U. S. 1,456,901, May 29. Structural features.

**Electric furnace.** KRISTIANSANDS NIKKELRAFFINERINGSVERK A. S. Norw. 35,570, Aug. 21, 1922. The material is applied from the sides in such a way that the inclined surface of the solid materials does not reach the electrode until just at the surface of the bath. (See fig.)



**Electric resistance furnace.** P. H. BRACE. U. S. 1,456,865, May 29. The pat. relates to H<sub>2</sub>O-cooled electrode mountings.

**Electric resistance furnace.** C. L. IPSEN. U. S. 1,456,107, May 22.

**Electric resistance furnaces.** G. M. LITTLE. U. S. 1,456,890-1-2-3-4, May 29. Various structural features.

**Electric arc furnace adapted for melting brass, copper or aluminium.** I. R. VALENTINE. U. S. 1,457,718, June 5.

**Electric furnace for continuous distillation of zinc and other volatile metals.** F. THARALDSEN. Norw. 34,947, May 22, 1922. Cf. C. A. 16, 2644. The bottom of the furnace is movable. The material is fed in a thin layer. The evapn. takes place from the surface only, which is heated by radiation from an elec. arc under the furnace vault.

**Channel- or tunnel-furnace for electrothermic dry reduction of iron ore.** P. FARUP. Norw. 33,795, Jan. 9, 1922. The tunnel has a small cross-sectional area at both ends and is considerably widened out at the middle part in order to attain a rapid heating and cooling of the material and provide more time for the main reaction. The gas may be regenerated during its way through the furnace by feeding coal, tar, etc. in openings placed at different intervals along the tunnel. If the heat is produced by elec. arcs under the furnace vault, a too sharp heating of the materials at this point may be avoided by placing small arches just beneath the elec. arcs.

**Induction furnace.** ALBERT HJORTH. Norw. 36,355, Dec. 11, 1922. The fusion bath is enclosed by an air-tight chamber where high pressure or vacuum can be applied.

**Electrically heated roasting furnace.** A. THESEN. Norw. 34,245, Feb. 27, 1922. The heating elements are placed on a carrying arrangement inside the furnace in order to attain a good heat economy. The furnace is a horizontal, slightly inclined rotary kiln, enclosed by an air-tight shell.

**Permeameter furnace.** G. A. KELSALL. U. S. 1,457,438, June 5.

**Apparatus for electric precipitation of suspended particles from gases.** W. W. STRONG. U. S. 1,456,044, May 22.

**Electrolytic magnesium.** G. HUTCHINSON. U. S. 1,457,225, May 29. In production of Mg by electrolysis MgCl<sub>2</sub> is fused with about 10% of another chloride such as NaCl (with access of air) which serves to facilitate the process. NH<sub>4</sub>Cl 10% and NaF 1% are also used.

**Electrolytic reduction of magnesium from magnesium chloride.** C. B. BACKER. Norw. 34,247, Feb. 27, 1922. The Cl that forms at the anodes is brought into immediate reaction with MgO mixed with C (coke), applied on the surface of the electrolyte around the electrodes (anodes). The sp. gr. of the electrolyte must be at least 3.3, which is obtained by the following compns.: 70% BaCl<sub>2</sub>, 15% MgCl<sub>2</sub> and 15% CaCl<sub>2</sub>, or 40, 30, 20, 10% of BaCl<sub>2</sub>, BaF<sub>2</sub>, MgCl<sub>2</sub> and CaCl<sub>2</sub>, resp. Other mixts. may be used. The temp. is kept at about 800°.

**Electrolytic refining or separation of metals in fused electrolytes.** H. SKAPPEL. Norw. 34,458, Oct. 2, 1922. The fused bath may have a compn. varying with the different metals to be sepd. and may consist of halogen salts, alkali compds., sulfides, sulfates, borates, phosphates, silicates, arsenates, antimonates, stannates, etc. An app. for sepg. Ag from Au is described in detail.

**Calcium carbide.** ALBY UNITED CARBIDE FACTORIES. Norw. 35,711, Sept. 18, 1922. Besides limestone the raw materials contain burned lime in amts. exceeding 30% of the theoretically required quantity of CaO.

**Electroplating aluminium.** H. D. CUNNINGHAM. U. S. 1,457,149, May 29. Al is prepd. for electroplating with Ni or other metals by cleaning the Al, then treating it with a mixt. of pumice or other abradant and a soln. of CuSO<sub>4</sub> to remove oxide and coat the Al with Cu.

## 5—PHOTOGRAPHY

C. E. K. MEES

Review of photography. A. GRANGER. *Mon. sci.* [5] 12, 121-33(1923).

E. J. C.

The graininess of photographic materials used in the motion-picture industry. A. C. HARDY AND L. A. JONES. *Trans. Soc. Mot. Pict. Eng.* 14, 107-19(1922); *Am. Cinemat.* 3, 7, 16.—The graininess of a photographic image can be measured subjectively; an instrument for the purpose is described. The graininess is found to depend upon the exposure; the min. graininess in a motion-picture positive is produced by the minimum exposure of the original negative. The time of development of the negative has very little influence on the graininess of the resulting print when a const. positive quality is maintained. Diln. of a developing soln., in general, produced a slight increase in graininess. Graininess was found to be almost entirely independent of the developing agent used. Fixing, washing, and drying conditions were found to have very little effect on graininess. Prints made by ultra-violet light showed a measurable decrease of graininess. This was also found to be the case when diffused light was used in making the prints.

C. E. K. MEES

A study of dichromated gelatin with reference to photogravure. H. M. CARTWRIGHT. *Phot. J.* 63, 265-77(1923).—The thickness of the insol. film produced by exposure of dichromated carbon tissues is proportional to the optical density. The curves showing the relation between the thickness and the exposure are of the usual characteristic shape. The spectral sensitivity is in the extreme violet and ultra-violet. The penetration time of  $\text{FeCl}_3$  soln. through gelatin films is nearly proportional to the thickness, the proportionality factor being dependent on the concn. of the soln. so that the slope of the curve relating penetration to thickness (contrast) varies from 0.05 for a soln. of  $34^\circ \text{Bé.}$  to 2.8 for one of  $44^\circ \text{Bé.}$  The contrast varies greatly with the temp., decreasing with a temp. increase. It is also somewhat dependent on the humidity of the film.

C. E. K. MEES

The permanency of films. K. KISSE. *Phot. Ind.* 1922, 333-4.—A general discussion of the properties of films both for motion-picture purposes and for hand-camera and portrait use. The subject is divided into 3 classes: the permanency of the light-sensitive emulsion; the permanency of the developed, exposed image; and the permanency of the film base. The essential characteristics of each of these classes are described.

C. E. K. MEES

The latent picture. A. PH. *Natuurwetenschapp. Tijdschr.* 5, 14-6(1923).—A review of the hypotheses concerning the photographic plate.

R. BRÜTNER

Dichroic defects in the emulsion and yellow stain. H. SPÖRL. *Phot. Chronik* 29, 2(1922).—S. describes characteristic stains which may be traced to dichroic fog. For enlarging from a negative stained with dichroic fog S. recommends bathing the negative in a 1 : 50 soln. of  $\text{K}_3\text{Fe}(\text{CN})_6$  with bromide and enlarging from the bleached negative resulting. For direct printing this method is not desirable and the "Senol" toning process is preferable, followed by after-treatment with Farmer's reducer.

C. E. K. MEES

The reduction centers in a bromide emulsion. W. CLARK. *Phot. J.* 47, 30-7; *Brit. J. Phot.* 70, 227-8(1923).—The reduction centers of developable halide grains may be produced in manuf. or may arise only on exposure to light. In the present work plates coated with a single layer of grains were treated both with reducing agents which produce developability and with oxidizing agents which remove the latent image.  $\text{Na}_2\text{AsO}_4$  produces reduction centers similar to those produced by light. No reaction whatever can be found between arsenite and  $\text{AgBr}$ , and it is concluded that the arsenite acts on some material in the grains distinct from  $\text{AgBr}$ . This material may be the chief source of the sensitivity of the grains. Since chromic acid removes the latent image and also greatly diminishes the sensitivity, it is thought that it destroys the material producing sensitivity. After treatment with chromic acid a fast plate gave a const. min. speed of 5 H. and D.; a process plate, 3 H. and D. Colloid-free plates of pure  $\text{AgBr}$  are known to have speeds of this order. It is concluded that the sensitivity of very fast plates depends on the existence of some special material in the bromide grains and that the residual small sensitivity is inherent in the  $\text{AgBr}$  itself.

C. E. K. MEES

New experiments in the degelatinizing of plates. F. LIMMER. *Brit. J. Phot.* 70, 286-87(1923).—For cleaning plates a 1% soln. of  $\text{NH}_4\text{F}$  is used. Success depends upon not leaving the plate in the soln. any longer than necessary, rinsing the glass at once, and

rubbing it dry. Another method suitable both for plate and film is the "Degomma" method introduced by Roehn and Haas of Darmstadt. The material is an enzyme which in 1/4% soln. attacks and dissolves the gelatin leaving a sludge of silver. It is concluded that this is the best method for use with film. C. E. K. MEES

**The washing of photographic products.** II. K. C. D. HICKMAN. *Phot. J.* 63, 208-12(1923); cf. *C. A.* 16, 3269.—During washing hypo is generally oxidized or decomposed and its detn. with I is therefore misleading. By cond. methods 3 parts in ten millions can be detected and accurate figures obtained rapidly during washing. A special double cell is used in which the water used in washing is balanced against the same water after its use. C. E. K. MEES

**A long-keeping developer.** J. W. GIFFORD. *Phot. J.* 63, 239(1923).—The following formula has kept well for ten years: Soln. A, sodium metabisulfite 1/2 oz., NaBr 1 dram, citric acid 1 dram, pyro 1 oz., H<sub>2</sub>O 9 oz., 1 dram. Soln. B, satd. soln. of Na<sub>2</sub>CO<sub>3</sub>. For use take 1 part A, 8 parts B and 7 parts water. The keeping qualities are ascribed to the use of sodium salts alone. C. E. K. MEES

**Acceleration of action of amidol with hypo.** ANON. *Camera* 27, 274-5(1923).—One to three minims of hypo to 40 cc. of amidol developer will greatly increase the speed of development and will not give fog. C. E. K. MEES

**Brown tones by development.** W. F. A. ERMEN. *Brit. J. Phot.* 70, 299-300 (1923).—The following formula is recommended for use with *o*-aminophenol: Soln. A, *o*-aminophenol sulfate 5 g., NaHSO<sub>4</sub> 35 cc. (or K<sub>2</sub>S<sub>2</sub>O<sub>8</sub> 25 g.), H<sub>2</sub>O to 200 cc. Soln. B, NaOH 10 g., H<sub>2</sub>O to 100 cc. Soln. C,  $\alpha$ -naphthol 5 g., soln. B 30 cc., H<sub>2</sub>O to 500 cc. For use take 20 cc. of A, 8 cc. of B, and dil. to 100 cc. Without  $\alpha$ -naphthol less contrast is obtained. Brown-toned images are given by the formula on lantern slides and most bromide papers. The addition of hydroquinone makes the tone colder. Pyrogallol makes the brown of an olive tone; when this is added the amt. of soln. B must be decreased to the point where the *o*-aminophenol base first pptd. is not entirely redissolved. C. E. K. MEES

**Variety of tone in sulfide toning.** R. PARKER. *Amat. Phot.* Jan. 17, 1923, p. 46.—A table gives proportions of K<sub>3</sub>Fe(CN)<sub>6</sub>, KBr, HgCl<sub>2</sub>, Na<sub>2</sub>S and Schlippe's salt to be used for obtaining black, brown-black, dark brown, brown, warm brown, red-brown, and red chalktones on bromide or gaslight papers. C. E. K. MEES

**Gold-free toners.** H. ZAEFERNICK. *Camera* (Luzern), January 1923, p. 133.—A discussion of the toning of various papers with alkali sulfides, Se preps. and lastly, a combination of S and Se toners. C. E. K. MEES

**Quantum theory of photographic exposure (SILBERSTEIN) 3.** The peculiarities of photographic paper (HITCHINS) 23. Light filter with variable transmission (BUTSCHOWITZ) 1.

**Photography; ornamenting.** WADSWORTH WATCH CASE CO. *Brit.* 189,433, Oct. 9, 1922. A process of reproducing designs on metal for the production of printing plates, or on metal, ceramic, vitreous, etc., surfaces for the production of ornamental effects, consists in covering the surface with a slowly drying coating, in selectively accelerating the drying of certain areas by optically projecting an image thereon while the coating is still wet, and in subsequently removing the unset portions of the coating by treatment with a solvent. The coating may be of thin varnish having a resin, gum or other base, e. g., copal varnish admixed with substances which accelerate drying, such as tung oil, metallic resins, turpentine, etc.; and the dried-on varnish, burnt in if necessary may be used as a resist in subsequent etching, electroplating or like treatment. The optically projected image may be a lantern slide positive or negative transparency of any design or subject in line or half-tone. If the hardened varnish is intended itself to form the permanent image, it may be incorporated with coloring material or other decorative ingredient. A design may be produced on china or porcelain by employing a coating contg. a metallic pigment and may be subsequently burnt in. Numerous variations in the compn. of the coating are described in the Specification.

**Photographic emulsion.** F. W. HOCHSTETTER. *Fr.* 545,944, Aug. 5, 1922. NaCl, KBr and KI are dissolved in H<sub>2</sub>O; to this are added alc. and cobalt blue, with which is mixed a soln. of soft gelatin; finally an aq. soln. of AgNO<sub>3</sub> and NH<sub>3</sub> is added. Cf. *C. A.* 16, 4151.

**Photographic emulsion.** F. W. HOCHSTETTER. *Fr.* 545,854, Aug. 2, 1922. To a mixt. of distd. water, NH<sub>4</sub>Cl, NH<sub>4</sub>Br, KI, alc. and cobalt blue is added a soln. of soft gelatin in distd. water; to this is added a soln. of AgNO<sub>3</sub> in distd. water, neutralized by NH<sub>4</sub>OH. Cf. *C. A.* 16, 4151.

**Self-toning photographic emulsion.** E. R. BULLOCK. U. S. 1,454,209, May 8. A Te salt such as a Na telluryl tartrate is included in an emulsion mixt. contg. a sensitive Ag salt, e. g., an emulsion of AgCl for "printing-out," in order to render the compn. self-toning.

**Emulsion support.** F. W. HOCHSTETTER. Fr. 545,943, Aug. 4, 1922. A translucent support particularly for motion-picture use is made by passing paper through a warm bath of linseed oil, gum lac and alc. and then through a mixt. of gelatin, linseed oil, gum lac and alc. and chrome alum. Instead of the second bath dichromated gelatin may be used.

**Emulsion support.** F. W. HOCHSTETTER. Fr. 545,945, Aug. 5, 1922. The paper is passed through a warmed bath of alc. and castor oil, then over heated rolls and through a bath of vaseline and naphtha.

**Photographic reliefs.** G. KOPPMANN. Ger. 358,165, 358,166, 358,167, Sept. 4, 1922, and 358,849, Sept. 15, 1922. Addns. to 309,193. Pyrocatechol developer contg. half its wt. of sulfite or a hydroquinone developer contg. a small amt. of sulfite or a pyro developer contg.  $\frac{1}{4}$ - $\frac{1}{2}$  its wt. in sulfite is used. See also German patents 310,037 and 310,038. A pyro-metol developer is also suggested.

**Wash-out gelatin reliefs.** T. P. MIDDLETON. Brit. 190,501, Dec. 27, 1922. A composite tissue for making wash-out reliefs after transfer in known manner consists of a baryta-coated paper base bearing a stratum of sol. gelatin upon which is laid a sensitive stratum of gelatino-halide Ag emulsion contg. no more chrome alum or other hardening agent than is needed, according to the gelatin used, to adjust it to dissolve readily in water at or about a temp. of 95° F. Alternative processes are described for producing local insolv. of the gelatin in the presence of the Ag image either before or after fixing or by development with pyrogallol and  $\text{NH}_4$ . Transfer follows and subsequent treatment with warm water, concd. soln. of  $\text{Na}_2\text{Cr}_2\text{O}_7$ , or other solvent of gelatin to obtain a relief image.

**Actinometric paper.** H. SIEBER. Ger. 366,042, Dec. 28, 1922. Actinic rays are measured by the use of sheets of material coated with gelatin contg.  $\text{AgNO}_3$  and  $\text{AgNO}_2$ .

**Developing agents.** H. BUCHERER. Ger. 364,391, Nov. 21, 1922. Certain monohydroxyl benzene and naphthalene compds. are found to be active developing agents in spite of the fact that the amino groups are in combination with alkyl and aryl sulfonyl radicals. One example is *p*-toluenesulfonylaminophenol.

**Silver and gelatin recovery from waste films.** D. B. MACDONALD. Brit. 191,091, Jan. 4, 1923. The film is passed through a bath of Na sulfate of about 5% strength, and is then treated with a soln. of Cu chloride or sulfate in HCl to convert the Ag into chloride. This is dissolved out with Na or K cyanide or thiosulfate and the Ag recovered by electrolysis or pptd. as sulfide. The film is washed with water, which may contain a hardening agent, such as alum, or a neutralizing agent, such as  $\text{NaHCO}_3$ , and is finally treated with hot water, which may contain a little alkali, to remove the gelatin. In the conversion of Ag into chloride a soln. of  $\text{FeCl}_3$  or  $\text{Fe}_2(\text{SO}_4)_3$  or the perchloride or persalts of similarly acting metals may replace the Cu compds.

**Stripping film.** FARBENFABRIKEN VORM. F. BAYER & Co. Ger. 357,001, Aug. 15, 1922. 357,720, Sept. 1, 1922. 358,285, Sept. 13, 1922. Over baryta-coated stock is caused to flow a slightly hardened gelatin soln., a cellulose acetate layer and then a pyroxylin soln. followed by a gelatin soln. in AcOH. This is coated with a hardened gelatin layer upon which the sensitive emulsion is placed. The cellulose layers strip off and may be attached to glass plates or other material carrying a gelatin soln. The cellulose acetate layer may have triphenyl phosphate, or triacetin added thereto to render it more easily stripped.

**Motion-picture film.** C. J. COBERLY. U. S. 1,455,428, May 15. Motion picture films are rendered antistatic by providing the film (formed mainly of a nitrocellulose compn.) with a layer of material such as LiCl which is hygroscopic in atms. of 70% relative humidity or below.

**Color prints.** W. P. CARPMAEL. Brit. 189,844, Dec. 11, 1922. In the production of monochrome prints, or multicolor photographs obtained by the superimposition of films carrying monochrome prints, the films employed contain coloring matter consisting of resin or other transparent substance insol. in water, combined with a dye. The films may be of celluloid coated with gelatin layers contg. less coloring matter nearest the celluloid than next the outer surface.

**Fluorescent screen.** BRITISH THOMSON-HOUSTON Co., LTD. Brit. 190,201, Dec. 18, 1922. Fluorescent screens have a surface layer impregnated with a non-saponifiable water-repellent or waxy material. Screens of various kinds may be so

impregnated, *e. g.*, those consisting of Ca tungstate, willemite or Ca sulfide may by the use of binders of various compns. such as casein, pyroxylin, and celluloid. An example is given of the prepn. and impregnation of the screen described in 175,428 (C. A. 16, 2086). The impregnant may be paraffin, or a mixt. thereof with a wax such as carnauba, spermaceti, or beeswax, and may be applied in the fluid or solid state.

**Fluorescent screens.** BRITISH THOMSON-HOUSTON Co. Brit. 190,792, Dec. 27, 1922. Fluorescent screens free from voids and roughness of surface, and not readily scratched, are produced by mixing finely divided fluorescent material with a fraction of its wt. of a binding material such as celluloid or other cellulose compd. and a suitable solvent, bringing the mixt. by evapu. to a consistency too stiff to pour, and shaping it mechanically to sheet form, as by rolling or cutting. In an example, the screen material comprises 80 to 90 parts of Ca tungstate incorporated with 20 to 10 parts of pyroxylin, with or without the addn. of camphor, a small quantity of solvent such as AmOAc, MeOAc, etc., being added to produce a plastic mass.

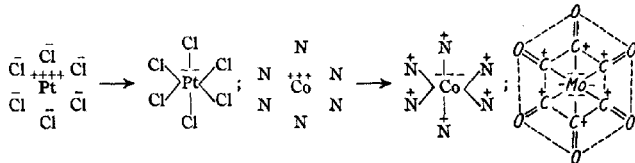
**Projection picture screen.** F. J. ADAMS. U. S. 1,455,982, May 22. Flexible starch-loaded screens are coated with paraffin to diffuse light rays. The coated fabric is preferably preliminarily fireproofed with  $\text{NH}_4$  salts, *e. g.*, chloride, phosphate and sulfate.

**Light-printed stencils.** J. D. COE. Fr. 543,404, June 2, 1922. The tissue impermeable to ink is coated with a soln. of glycerol, gum and  $\text{K}_2\text{Cr}_2\text{O}_7$ . It is exposed to the desired light characters, and the unexposed portions are washed off. Then a corrosive substance such as NaOH is used to render the tissue permeable to ink.

## 6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

**Other factors influencing coordination.** T. M. LOWRY. *Chemistry & Industry* 42, 412-5 (1923).—(1) Sharing of electrons in coordination has the effect of transferring electrons from the radicals to the metal and these then become united by covalencies. When two electrons are shared, an atom which contributes both of them to the common stock acquires a positive charge while the atom which acquires a half-share in the two electrons not previously held by it acquires a negative charge. Examples, chloroplatinates, cobaltamines and metal carbonyls:



The bivalent anion,  $\text{PtCl}_6^{--}$ , contains 6 neutral Cl atoms, held by covalencies, while the double negative charge of the anion is carried by the Pt. In the amines each mol. of  $\text{NH}_3$  acquires a positive charge as in  $\text{NH}_4^+$  ion while the metal becomes negative. In the carbonyl the outer O atoms are neutral but doubly bound. (2) Coordination can be effected under very adverse conditions by making the coordinated groups part of a conjugated ring-system. The possibility of forming coordination compds. with the alkali metals depends on bringing the metal into stable rings. It is for this reason that tripolar ions rather than bipolar ions are used so frequently to prep. coordination complexes. Several examples are cited and the structural formulas given. A. R. M.

**Properties of ammonium nitrate. V. Reciprocal salt-pair, ammonium nitrate and potassium chloride.** E. P. PERMAN AND H. L. SAUNDERS. *J. Chem. Soc.* 123, 841-9 (1923); cf. C. A. 17, 502.—Methods were those previously used. A sharper reading of the crystallizing point was obtained by placing a metal filament lamp behind the tube of fused salt. The chief difference between this system and the system  $\text{NH}_4\text{NO}_3$ -NaCl studied in Part IV is that in this case the two nitrates are isomorphous. The f. p. of  $\text{NH}_4\text{NO}_3$  is lowered from  $169^\circ$  to  $156.5^\circ$  by addn. of  $\text{KNO}_3$ , mixed crystals of the two salts, sepg. at that temp. By addn. of  $\text{NH}_4\text{Cl}$  and  $\text{KNO}_3$  the f. p. of  $\text{NH}_4\text{NO}_3$  is lowered to  $134.5^\circ$ . At this temp. the equil. diagram shows a ternary eutectic for  $\text{NH}_4\text{NO}_3$ ,  $\text{NH}_4\text{Cl}$  and mixed crystals of  $\text{KNO}_3$  and  $\text{NH}_4\text{NO}_3$ . Another ternary point, not realizable

at ordinary pressures, appears probable. When an isomorphous mixt. (or mixed crystals) forms a definite eutectic, the character of the equil. system appears to be the same as when no isomorphous mixts. are present.

**Step crystals.** P. ROMSTEDT. *Ber. pharm. Ges.* 33, 98-9 (1923).—Reply to a paper by Kunz-Krause (*C. A.* 17, 1761).

**Pyrocatechol-antimonic acid compounds.** R. WEINLAND AND RUDOLF SCHOLDER. *Z. anorg. allgem. Chem.* 127, 343-68 (1923).—The ability of pyrocatechol (I), to form complex ions with Fe, Cr, Al, Co, Mo and As (cf. *C. A.* 7, 2396; 8, 1767; 9, 305; 14, 63; 15, 74) applies likewise to Sb. Only in the case of the  $Hg^+$  salt was the acid tri-basic. [In all formulas R is  $-OC_6H_4O-$ .] **Triccatechol-antimonic acid**,  $SbO(RH)_3 \cdot 6H_2O$  (II), prepd. from moist  $Sb_2O_3$  and I, is pale green, melts to a green liquid, decomposes at a higher temp., gives an acid reaction in  $H_2O$ , hydrolyzes very slowly and its satd. soln. contains 41% II. The K, Na and  $NH_4$  salts were prepd. from II and the hydroxide, the Ag, Fe, Ni, Co, Mn, Cu, Al and Mg salts by addn. of a sol. salt to II. The Fe, Ni, Co, Mn, Cu and Mg salts lose  $2H_2O$  over concd.  $H_2SO_4$ , the Al salt  $12H_2O$  and the Ag, Ca and Ba salts none. **K salt**,  $(SbOR)_3H_3K \cdot 1/2 H_2O$  (III), sol. in twice its own wt. of  $H_2O$ , with acid reaction.  **$NH_4$  salt**,  $(SbOR)_3H_3NH_4 \cdot 1/2 H_2O$  (IV). **Na salt**,  $(SbOR)_3H_3Na \cdot 4.5H_2O$ . **Ag salt**,  $(SbOR)_3H_3Ag$ . **Zn salt**,  $(SbOR)_3H_3Zn \cdot 8H_2O$ , pale green. **Fe salt**,  $(SbOR)_3H_3Fe \cdot 8H_2O$ , pale green. **Ni salt**,  $(SbOR)_3H_3Ni \cdot 8H_2O$ , pale green. **Co salt**,  $(SbOR)_3H_3Co \cdot 8H_2O$ , reddish gray. **Mn salt**,  $(SbOR)_3H_3Mn \cdot 8H_2O$ , green. **Cu salt**,  $(SbOR)_3H_3Cu \cdot 8H_2O$ , green. **Al salt**,  $(SbOR)_3H_3Al \cdot 15H_2O$ , green. **Mg salt**,  $(SbOR)_3H_3Mg \cdot (RH)_2 \cdot 2H_2O$ , green. **Ca salt**,  $(SbOR)_3H_3Ca \cdot (RH)_2 \cdot 2H_2O$ . **Ba salt**,  $(SbOR)_3H_3Ba \cdot 2(RH)_2 \cdot 2H_2O$ . **K salt with excess I**,  $(SbOR)_3H_3K \cdot 2(RH)_2 \cdot 2H_2O$  (V), prepd. from *acidum stibicum* (Merck) and concd. I, from  $KSbO_3$  and I or from I and III, loses no  $H_2O$  over  $H_2SO_4$ , gives a deep green with aq.  $FeCl_3$ . **Chloropentaquochromic salt**,  $(SbOR)_3H_3 \cdot [CrCl(5H_2O)]_2 \cdot 2SbOR_3 \cdot 18H_2O$ , prepd. from II and  $CrCl_3 \cdot 6H_2O$ , green, loses  $H_2O$  over  $H_2SO_4$  in *vacuo*.  **$Hg^+$  salt**,  $(SbOR)_3H_3Hg$ , from II and  $HgSO_4$  in dil.  $H_2SO_4$ , gray-green.  **$C_6H_5N$  salt**,  $(SbOR)_3H_3C_6H_5N$  (VI), from I, II and  $C_6H_5N$  in excess HCl, or from V, excess I and  $C_6H_5N$  in HCl. **A second  $C_6H_5N$  salt**,  $(SbOR)_3H_3C_6H_5N \cdot H_2O$  (VII), from  $KSbO_3$ , I and  $C_6H_5N$  in HCl. **Anomalous  $C_6H_5N$  salt**,  $(SbOR)_3H_3C_6H_5N \cdot 2C_6H_5N$  (VIII), from VI and  $C_6H_5N$ , decompd. by  $H_2O$ .  **$C_6H_7N$  salt**,  $(SbOR)_3H_3C_6H_7N$ , from I, II and  $C_6H_7N$  in HCl, S-yellow. **Anomalous  $C_6H_7N$  salt**,  $(SbOR)_3H_3C_6H_7N$ , prepd. like VII, golden-yellow. **Anomalous  $NH_4$  salt**,  $(SbOR)_3H_3 \cdot 3NH_3$ , from II and excess  $NH_4OH$ , decompd. by  $H_2O$  to IV. **K salt with binuclear anion**,  $[Sb_2O_5(RH)_2]_2 \cdot [K_2 \cdot 6H_2O]$ , from aq. V and concd. KBr. Eighteen isomorphous mixts. are listed, comprising mixts. of II with  $6H_2O$  and the K salt with  $4H_2O$ , prepd. from *stibium oxydatum* (Merck) with varying proportions of aq. I. II and all its salts have an intensely bitter taste. The alkali salts hydrolyze slowly in  $H_2O$  like II. The salts of the bivalent metals give in dil. aq. soln. with  $FeCl_3$  a pale green color which quickly vanishes. More  $FeCl_3$  gives no further green. Those compds. contg. I in the cation give an immediate deep green color with  $FeCl_3$ . Aq. solns. of II or its alkali salts are pptd. neither by concd. acids nor by alkalis, and only extremely slowly by  $H_2S$  when hot. The coordination no. of Sb in II is 4.

C. C. DAVIS

**Dipyridino derivatives of iridium.** MARCEL DELÉPINE. *Ann. chim.* 19, 5-31 (1923).—More extended account of the researches previously reported (*C. A.* 5, 2605, 2787; 16, 535; 17, 698, 1197, 1198, 1927).

A. R. M.

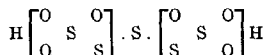
**Chromic malate and chromimalic acid.** J. BARLOT AND PANAITOPOL. *Bull. soc. chim.* 33, 306-11 (1923).— $Cr_2(C_4H_4O_6)_3$  was prepd. by direct action of the acid on  $Cr(OH)_3$  at water-bath temp.; subsequent evapn. at  $100^\circ$  leaves a greenish vitreous mass which can be purified by repeated soln. in water and pptn. by acetone. The yield is poor, not over 10%. The materials require careful preliminary purification, details of which are given. It was also prepd. by interaction of  $Cr_2(SO_4)_3$  with Pb malate at  $100^\circ$  in presence of a little  $AcOH$ , the function of which is not apparent. Strong acids are not similarly effective. After reaction is complete, the soln. is filtered, concd., Pb pptd. by  $H_2S$ , excess of  $H_2S$  removed and the salt pptd. by dropwise addn. to acetone. The greenish gray crystals are hygroscopic and are dried in *vacuo* over  $H_2SO_4$ . It combines with acetone and hydration takes place during filtration as the acetone is removed, the malate taking on the appearance of a greenish viscous liquid. Once dehydrated and acetone-free, it is stable in air, insol. in cold and rather slowly sol. in hot water, insol. in ordinary org. solvents. The aq. soln. is acid, two eqvs. of H are neutralizable in presence of methyl orange and three more with phenolphthalein. The malate is quickly decompd. in aq. soln. and only a fresh soln. gives the malate reaction with  $NH_4 \cdot AgNO_3$ ; the Cr is not pptd. by alkali. Analysis of the green vitreous residue obtained by evapn. indicated  $2(Cr_2(C_4H_4O_6)_3) \cdot 13H_2O$  or  $H_4(C_4H_4O_6)_3 \cdot Cr(OH)_3$ .



$8\text{H}_2\text{O}$ , in striking analogy with the already known chromoxalic acid,  $\text{H}_2(\text{C}_2\text{O}_4)_2\text{Cr}_4(\text{OH})_4 \cdot 4\text{H}_2\text{O}$ . The Pb salt of this chromimalic acid was obtained in crystals of a clearer gray color than the malate by adding the soln. obtained as above to acetone. Analysis agreed well with  $\text{Pb}_4[(\text{C}_2\text{H}_2\text{O}_4)_2\text{Cr}_4(\text{OH})_4 \cdot 8\text{H}_2\text{O}]_2$ .

**Halogen salts of tellurium.** A. DAMIENS. *Ann. chim.* 19, 44-119(1923).—A very complete account, with equil. diagrams, sketches of app., etc. of the work previously reported (*C. A.* 15, 994, 1845; 16, 32, 33).

**The energy content and constitution of the potassium polythionates.** F. MARTIN AND L. METZ. *Z. anorg. allgem. Chem.* 127, 83-100.—The heats of formation of  $\text{K}_2\text{S}_2\text{O}_8$ ,  $\text{K}_2\text{S}_3\text{O}_{10}$ ,  $\text{K}_2\text{S}_4\text{O}_{12}$ , and  $\text{K}_2\text{S}_5\text{O}_{14}$  as well as  $\text{K}_2\text{S}_2\text{O}_8$  and  $\text{K}_2\text{S}_3\text{O}_{10}$  were detd. calorimetrically by combustion in a Pt-lined Berthelot-Mahler bomb. In order to insure complete combustion it was necessary to use  $\text{KClO}_4$  and Mg. The heats of formation (in cal.) thus found were  $\text{K}_2\text{S}_2\text{O}_8 = 415$ ,  $\text{K}_2\text{S}_3\text{O}_{10} = 401$ ,  $\text{K}_2\text{S}_4\text{O}_{12} = 393$ ,  $\text{K}_2\text{S}_5\text{O}_{14} = 386$ ,  $\text{K}_2\text{SO}_4 = 273$ ,  $\text{K}_2\text{S}_2\text{O}_7 = 283$ . Thus the addn. of solid S from the lower to the higher polythionates is endothermic. The constitution of these compds. is discussed from the viewpoint of Werner's theory. The coord. no. assigned to the central S atom is 4 with a valence of +6, while the peripheral S has a valence of -2. Thus, the constitution of pentathionic acid is



**Complex thiocyanates of tervalent elements.** G. SCAGLIARINI AND G. TARTARINI. *Gazz. chim. ital.* 53, 139-43(1923).—For tervalent metals the pentacid-aquo type of complex  $[\text{M}^{\text{III}}\text{X}_5\text{H}_5\text{O}]\text{M}^{\text{I}}$  (in which X is a halogen or CN but not CNS) is common. Grossman (*Z. anorg. allgem. Chem.* 37, 442) states that the complexes derived from Al, Cr, Fe, Bi and V and CNS are all hexa-acid salts. Bjerrum (*C. A.* 16, 2275) in studying the action of  $\text{Cr}^{\text{III}}$  salts with alk. thiocyanates showed that the ion  $[\text{Cr}^{\text{III}}(\text{SCN})_5]^{3+}$  is first formed. The pentathiocyanates (A) are formed by decompn. in aq. soln. by heat or light. B. isolated A as quinoline salt  $(\text{C}_8\text{H}_7\text{NH})_2\text{Cr}(\text{SCN})_5 \cdot 2\text{H}_2\text{O}$  of which  $\text{H}_2\text{O}$  is lost over  $\text{CaCl}_2$ . Solns. of  $\text{NH}_4$  chromithiocyanate with hexamethylenetetramine sulfate ppt. lilac crystals of a mixt. the *hexamethylenetetramine aquochromipentathiocyanate*,  $(\text{C}_6\text{H}_{12}\text{N}_4\text{H})_2[\text{Cr}(\text{SCN})_5 \cdot \text{H}_2\text{O}]\text{H}_2\text{O}$  and *chromihexathiocyanate*  $(\text{C}_6\text{H}_{12}\text{N}_4\text{H})_2[\text{Cr}(\text{SCN})_6]$ , which were sepd. by a method used by B. 3 g.  $\text{NH}_4$  vanadithiocyanate in 10 cc.  $\text{H}_2\text{O}$  were treated with 3.5 g.  $\text{C}_6\text{H}_{12}\text{N}_4$  in 20 cc.  $\text{H}_2\text{O}$  and pptd. *hexamethylene aquovanadipentathiocyanate*, as red crystals. A concd. soln. of 1 mol.  $\text{Fe}(\text{NO}_3)_3 + 5$  mols.  $\text{NH}_4\text{SCN}$  treated with a concd. soln. of 2 mols.  $\text{C}_6\text{H}_{12}\text{N}_4$  acetate sepd. *hexamethylene aquoferripentathiocyanate*,  $(\text{C}_6\text{H}_{12}\text{N}_4\text{H})_2[\text{Fe}(\text{SCN})_5 \cdot \text{H}_2\text{O}]$ . A similar soln. treated with caffeine acetate gave *caffeine aquoferritrihiocyanate*,  $(\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2\text{H})_2[\text{Fe}(\text{SCN})_3(\text{OH})_2 \cdot \text{H}_2\text{O}]$ . With the corresponding Al salt hydrolysis is complete and hexamethylene thiocyanate is pptd. under these conditions.

**Constitution of per-salts with special reference to percarbonates and perborates.** M. LEBLANC AND R. ZELLERMANN. *Z. Elektrochem.* 29, 179-87, 192-8(1923).—The salts  $\text{Na}_2\text{C}_2\text{O}_6$  and  $\text{NaHCO}_4$  prep'd. by Wolfenstein and Peltner (*cf. C. A.* 2, 1532) have been prep'd. in a much higher state of purity by a modification of their method. The compd.  $\text{Na}_2\text{C}_2\text{O}_6$ , like the persulfates and the perphosphates, undergoes hydrolysis with the formation of  $\text{NaHCO}_4$ . All the different methods for the prep'n. of Na perborate are based on the reaction,  $\text{NaBO}_2 + \text{H}_2\text{O}_2 = \text{Na}[\text{BO}_2\text{H}_2\text{O}_2]$ . This perborate is termed pseudo-perborate. Two new perborates have been prep'd.: the true Na perborate and the K pseudo-perborate. The first by the reaction  $\text{NaOOH} + \text{H}_2\text{BO}_2 = \text{NaBO}_2 + 2\text{H}_2\text{O}$ , and the latter by the addition of 3%  $\text{H}_2\text{O}_2$  to a dil. soln. of K metaborate. The influence of c. d. and of temp., as well as the starting products, on the yield have been studied in the electrolytic prep'n. of perborates and percarbonates. A classification of per-salts is given, and the close connection between di- and monoper-compds. explained. Reactions are sometimes attributed to di-per-compds. which are peculiar to the monoper-compds. that result from them by hydrolysis. The basicity of monoper-compds. is  $n-1$ , where  $n$  is the basicity of the normal compd. The true perborates occupy a special position. A method is given for deciding whether Na perborates and percarbonates are true per-salts or addition compds. with  $\text{H}_2\text{O}_2$ . Both  $\text{NaHCO}_4$  and  $\text{Na}_2\text{C}_2\text{O}_6$  are true per-salts. The compds.  $\text{Na}_2\text{CO}_4 \cdot 1.5\text{H}_2\text{O}$  (*i. e.*,  $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}_2 \cdot 0.5\text{H}_2\text{O}$ ) and  $\text{Na}_2\text{CO}_4$  are really mixts. of  $\text{NaOOH}$  and  $\text{NaHCO}_3$ .

**The formation of oxygen salts.** ROBT. BÜRSTENBINDER. *Chem.-Ztg.* 47, 381(1923).—Per-salts are formed by combining  $\text{H}_2\text{O}_2$  with cryst. compds., *e. g.*,  $\text{Na}_2\text{CO}_3$  or  $\text{Na}_2\text{SO}_4$ .

L. T. FAIRHALL

E. J. WITZEMANN

H. JERMAIN CREIGHTON

and sepn. from soln. by addn. of alcohol or by chilling. The products can be stabilized by addn. of  $\text{H}_3\text{PO}_4$ ,  $\text{NaCl}$ , starch paste, acylamides, gelatin, tannic acid, uric acid, naphthalene, oxalic acid, or soap. According to Ostwald, cryst. substances cannot, but colloids can hold gases in combination. Since the formation of per-salts is more physical than chem. they must contain not O but  $\text{H}_2\text{O}_2$  in a form of combination very similar to that of  $\text{H}_2\text{O}$  of crystn. This  $\text{H}_2\text{O}_2$  is gradually lost on weathering of the crystals. The effect of stabilizers on the oxygen content is governed by their ability to prevent crystal weathering.  $\text{H}_3\text{PO}_4$ ,  $\text{NaCl}$  and oxalic acid possess this power. The stabilizing effect of colloids is due, on the other hand, to their power to fix gaseous O.

HOWARD E. BATSFORD

Chemistry and chemical technology of the rare elements. LUDWIG MOSER. *Oesterr. Chem.-Ztg.* 26, 58-61(1923).—A review. D. MACRAE

Separation of the rare earths by basic precipitation. V. Preparation of cerium, lanthanum, and the colored earths from thorium-free monazite earths. WILHELM PRANDTL and JOSEPH LÖSCH. *Z. anorg. allgem. Chem.* 127, 209-14(1923); cf. C. A. 16, 3599.—One kg. of the crude monazite earth contg. 42.54%  $\text{CeO}_2$  was dissolved in concd.  $\text{HNO}_3$ , evapd. to a sirup, dild. with 3 l. boiling  $\text{H}_2\text{O}$  gradually decomposed with 350 g.  $\text{KBrO}_3$ ; the soln. was kept boiling and stirred. After settling the ppt. was washed thoroughly with 4%  $\text{KBrO}_3$  soln. The united clear acid filtrates were neutralized with  $\text{Na}_2\text{CO}_3$  soln. as far as possible without forming a permanent ppt. and again treated with  $\text{KBrO}_3$  (150 g.). The filtrate from the ppt. so formed was again neutralized with  $\text{Na}_2\text{CO}_3$  and then evapd. to a sirup, dild. to its original vol., and treated with  $\text{KBrO}_3$  to remove the last traces of Ce. From the carefully washed ppts. described above, 422 g. of pure  $\text{CeO}_2$  was obtained. The Ce-free solns. contained Nd, Pr, and La. In order to avoid a later troublesome evolution of N from the decompn. of the  $\text{NH}_4\text{BrO}_3$ , the solns. were united and pptd. with  $\text{NH}_4\text{OH}$ . The ppt. was washed by decantation and redissolved in  $\text{HNO}_3$ . This soln. was then treated with a soln. of 660 g.  $\text{CaO}$  in  $\text{HNO}_3$  and with 1100 g.  $\text{NH}_4\text{NO}_3$ , was dild. to about 7 l., heated nearly to boiling and fractionally pptd. in 8 fractions with  $\text{NH}_4\text{OH}$  soln. The concn. of  $\text{NH}_4\text{OH}$  used in pptn. was gradually increased from about 1% to 5% during the fractionation. The pptd. fractions were dissolved in  $\text{HCl}$ , freed of small amts. of Cd with  $\text{H}_2\text{S}$  and converted to the oxide through the oxalate. Five g. of oxide from each fraction was dissolved in  $\text{HNO}_3$  and dild. to 100 cc. The color and absorption spectrum of these solns. permitted conclusions as to the compn. of the oxide. In fractions 1 to 4 the Nd bands preponderated and then became weaker, while simultaneously the intensity of the Pr bands increased (fractions 5-8). The soln. of a ppt. obtained from the soln. remaining after the 8th fraction contains almost pure La and shows Nd, and Pr bands only very weakly. These expts. show that from the monazite earths in the course of one or two weeks the Ce can be obtained completely and in a pure state, the La in great part and of fair purity, and the colored earths collected in a few fractions. D. MACRAE

Precipitation of tungstic acid. J. A. M. VAN LIEMPT. *Z. anorg. allgem. Chem.* 127, 215-20(1923).—Ten-cc. portions of  $\text{Na}_2\text{WO}_4$  solns. of different concns. were mixed with acids of the same normality in the proportions 1 : 1, 1 : 2, and 1 : 5. Observations are given in tabular form for  $\text{HCl}$  at 25° and 100°,  $\text{H}_2\text{SO}_4$  at 25° and  $\text{HNO}_3$  at 25°. The particle diam. was about 1 micron and was almost independent of concn., acid, and temp. A given ppt. of tungstic acid consists of a mixt. of  $\text{WO}_3 \cdot \text{H}_2\text{O}$  (yellow) and an adsorption compd. of  $\text{WO}_3$  and  $\text{H}_2\text{O}$  (white). The former forms most with excess of acid and at higher concns. More  $\text{WO}_3 \cdot \text{H}_2\text{O}$  is formed with  $\text{H}_2\text{SO}_4$  than with  $\text{HNO}_3$  or  $\text{HCl}$  of the same concn. Better settling of the ppt. and better filtration are obtained with excess of  $\text{HCl}$ . D. MACRAE

Sodium fluophosphate and sodium fluovanadate extracted from bauxite. TRAVERS. *Bull. soc. chim.* 33, 297-306(1923).—Octahedral crystals sepd. upon cooling the mother liquors obtained by treating bauxite with  $\text{NaOH}$  soln. and subsequently pptg. the Al. By analysis these were shown to have the compn.  $2\text{PO}_4\text{Na}_3 \cdot \text{NaF} \cdot 19\text{H}_2\text{O}$  (76%) +  $2\text{VO}_4\text{Na}_3 \cdot \text{NaF} \cdot 19\text{H}_2\text{O}$  (22.2%) +  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  (1.5%). T. S. CARSWELL

Researches on the supposed volatility of tantic acid with hydrofluoric acid and on a few tantalum compounds. OTTO HAHN and KARL E. PÜTTER. *Z. anorg. allgem. Chem.* 127, 153-68(1923).—Statements in the literature concerning the volatility of the residue from evapd.  $\text{HF}$  solns. of tantic acid are contradictory. For this investigation pure tantic acid was prepd. by the oxidation of tantalum. The pure acid was not volatile in any case.  $\text{HF}$  solns. of pure tantic acid when evapd. and dried always undergo extensive hydrolysis. The dry residue shows no volatility when heated to redness. When the  $\text{HF}$  soln. contains fluorides, however, which form double salts with  $\text{TaF}_6$ , there usually is a loss of Ta at a red heat. Commercial tantic acid contg.

alkali usually gives a loss. With increasing alkali content there is increasing loss by volatility. The authors have prepd. and describe the following new compds.: a hydrate of *hydrogen tantalum fluoride*,  $\text{TaF}_5 \cdot \text{HF} \cdot 6\text{H}_2\text{O}$ ; *barium tantalum fluoride*,  $3\text{BaF}_2 \cdot 2\text{TaF}_5$ ; and *monoammonium tantalum fluoride*,  $\text{TaF}_5 \cdot \text{NH}_4\text{F}$ . Heating barium tantalum fluoride constitutes a convenient method of prepg. pure *tantalum pentafluoride*.

L. T. FAIRHALL

**Decomposition of potassium chlorate. I. Spontaneous decomposition temperatures of mixtures of potassium chlorate and manganese dioxide.** F. E. BROWN, J. A. BURROWS AND H. M. McLAUGHLIN. *J. Am. Chem. Soc.* **45**, 1343-8(1923).—Homogeneous mixts. of  $\text{KClO}_3$  and  $\text{MnO}_2$  contg. more than  $1/10$  and less than 5 mol. equivs. of  $\text{MnO}_2$  to 1 of  $\text{KClO}_3$  decomposed spontaneously at temps. characteristic for each mixt. The rapid rise in temp. and the acceleration of the reaction was due to exothermal decompn.

H. M. McLAUGHLIN

**Preparation of anhydrous halides.** GIUSEPPE ODDO AND UGO GIACHERY. *Gazz. chim. ital.* **53**, 56-63(1923).—O. and G. review fully the methods that have been used for the prepn. of anhyd. metallic halides. In 1899 O. and Serra (*Gazz. chim. ital.* **29**, II, 355(1899)) reported results on the use of  $\text{S}_2\text{Cl}_2$  in the prepn. of  $\text{AsCl}_3$ ,  $\text{SbCl}_3$  and  $\text{BiCl}_3$ . This method has been widely used and extended since that time by other writers (cf. original for many references). Meanwhile Barre (*C. A.* **6**, 3234) prepd. bromides with  $\text{S}_2\text{Br}_2$ . In renewing work on the method, O. and G. have obtained chlorides by mixing the metallic oxide with powd. S and adding Cl while heating the mixt. The iodides and bromides were obtained similarly. In this paper the prepn. of  $\text{AsCl}_3$ ,  $\text{AsBr}_3$  and  $\text{AsI}_3$  by this reaction is described:  $2\text{As}_2\text{O}_3 + 3\text{S} + 6\text{X}_2 \rightarrow 4\text{AsX}_3 + 3\text{SO}_2$ . 26.5 g.  $\text{As}_2\text{O}_3$  + 5.97 g. S were pulverized together and placed in a 0.5 l. flask under a condenser. The mixt. was warmed to incipient melting of the S and treated with  $\text{Cl}_2$ . After 3 hrs. the reaction is complete. On fractionally distg. the thick blackish liquid a 68% yield of  $\text{AsCl}_3$ , b.  $131-2^\circ$ , was obtained. The loss was due to volatility of  $\text{AsCl}_3$ . Results not so good were obtained by placing the mixt. in a boat in a Jena combustion tube and passing Cl over the heated contents. The old method of O. and S. (*l. c.*) is better than these methods for obtaining  $\text{AsCl}_3$ . The same mixt. was heated with 64.2 g.  $\text{Br}_2$  in a metal bath. After 7 hrs. the reaction was complete. The fused mass was decanted through glass wool for purification. A 70% yield of pure  $\text{AsBr}_3$  was obtained. The same mixt. was heated with 10.2 g.  $\text{I}_2$  at  $200^\circ$  for 14 hrs. until the vapors were orange-red. The crystals that sepd. overnight were purified from  $\text{CS}_2$  soln. A nearly theoretical yield of  $\text{AsI}_3$  free from S was thus obtained.

E. J. WITZEMANN

**The existence of ammonium hydroxide in solution.** R. M. CAVEN. *J. Soc. Chem. Ind.* 448-9(1923).—An answer to T. S. Moore's criticism of an earlier article by C. (cf. *C. A.* **17**, 1913). C. believes that the larger part of the compd. formed when  $\text{NH}_3$  dissolves in  $\text{H}_2\text{O}$  should be written  $\text{NH}_3 \cdot \text{H}_2\text{O}$ , not  $\text{NH}_4\text{OH}$ .  $\text{NH}_3$  should be classed as an alkali metal.

F. E. BROWN

**The composition of the hydroxides of copper.** L. LOSANA. *Gazz. chim. ital.* **53**, 75-88(1923).— $\text{CuO} \cdot \text{H}_2\text{O}$  undergoes dehydration easily and according to the voluminous literature on the subject gives the following hydrates in succession:  $3\text{CuO} \cdot \text{H}_2\text{O}$ ;  $4\text{CuO} \cdot \text{H}_2\text{O}$ ;  $6\text{CuO} \cdot \text{H}_2\text{O}$ ;  $7\text{CuO} \cdot \text{H}_2\text{O}$ ;  $8\text{CuO} \cdot \text{H}_2\text{O}$ . L. reviews these derivs. historically and then describes his own expts. the results of which are given in tables and graphs.  $\text{CuO} \cdot \text{H}_2\text{O}$  undergoes dehydration in 2 distinct ways. If dehydration takes place in the presence of a liquid, definite compds. corresponding to 3-, 4-, and 8- $\text{CuO} \cdot \text{H}_2\text{O}$  are formed, as was shown by the heating curves obtained at various temps. From the loss of wt. and from the vapor tension curves it was found that the dry compd. loses  $\text{H}_2\text{O}$ , giving 3-, 4-, 6-, and 8- $\text{CuO} \cdot \text{H}_2\text{O}$  but not 7- $\text{CuO} \cdot \text{H}_2\text{O}$ . The compd.  $8\text{CuO} \cdot \text{H}_2\text{O}$  also loses small amts. of  $\text{H}_2\text{O}$  (0.15-0.35%) but only at red heat and the formation of other definite compds. could not be established from the inconstant results obtained. The notable influence of alkali upon the ease of dehydration was confirmed in all cases and the opposite effect of basic salts was also demonstrated. The various hydrates of which the existence was detd. may be considered to be definite and quite stable compds.

E. J. WITZEMANN

**Preparation of thiocarbonyl chloride.** REMO DE FAZI. *Gazz. chim. ital.* **53**, 175-8(1923).—In attempts to modify Kolbe's method for the prepn.  $\text{CSCl}_2$  (*Ann.* **45**, 41(1843)) by treating  $\text{CS}_2$  with  $\text{Cl}_2$  at ordinary temp. it was found that the reagents reacted mostly thus:  $2\text{CS}_2 + 5\text{Cl}_2 \rightarrow \text{S}_2\text{Cl}_2 + 2\text{CCl}_3\text{SCl}$  and somewhat:  $2\text{CS}_2 + 3\text{Cl}_2 \rightarrow 2\text{CCl}_2\text{S} + \text{S}_2\text{Cl}_2$ . Klason (*Ber.* **20**, 2376(1887)) obtained  $\text{CSCl}_2$  by the reaction:  $\text{CCl}_3\text{SCl} + \text{SnCl}_2 \rightarrow \text{SnCl}_4 + \text{CSCl}_2$  and Frankland *et al.* (*C. A.* **14**, 3068; **15**, 509) perfected this method. Although Frankland, *et al.* state that  $\text{CCl}_3\text{SCl} + \text{Fe} \rightarrow \text{FeS} + \text{CCl}_4$  deF. has prepd.  $\text{CSCl}_2$  since 1917 thus:  $\text{CCl}_3\text{SCl} + \text{Fe} \rightarrow$

$\text{FeCl}_2 + \text{CSCl}_2$  and recently in 80% yield. The method and the catalysts used will not be described at present.

E. J. WITZEMANN

**The formation of sulfur by the action of sulfur dioxide on calcium sulfide, zinc sulfide and iron sulfide.** LOTHAR WÖHLER, F. MARTIN AND E. SCHMIDT. *Z. anorg. allgem. Chem.* 127, 273–94 (1923).—Up to  $1000^\circ$ ,  $\text{SO}_2$  and  $\text{CaS}$  react thus:  $\text{CaS} + 2\text{SO}_2 \rightarrow \text{CaSO}_4 + 2\text{S}$ . Above  $1000^\circ$  the reaction is:  $2\text{CaS} + \text{SO}_2 \rightarrow 2\text{CaO} + 3\text{S}$ . While the 1st reaction soon ceases, owing to the formation of a thick coating of  $\text{CaSO}_4$  over the  $\text{CaS}$ , the 2nd reaction continues to completion. Addn. of  $\text{CaO}$  or  $\text{CaCO}_3$  acts catalytically and increases the rate of reaction. The reaction between  $\text{ZnS}$  and  $\text{SO}_2$  is:  $2\text{ZnS} + \text{SO}_2 \rightarrow 2\text{ZnO} + 3\text{S}$ . The rate is very slow, owing to the formation of a basic sulfide which forms a thick coating over the unchanged  $\text{ZnS}$ . The reactions between pyrite and  $\text{SO}_2$ , which are  $3\text{FeS} + 2\text{SO}_2 \rightarrow \text{Fe}_3\text{O}_4 + 6\text{S}$  and  $3\text{FeS}_2 + 2\text{SO}_2 \rightarrow \text{Fe}_3\text{O}_4 + 8\text{S}$ , proceed to completion in a short time. The rate of reaction is greatly increased by the addn. of  $\text{Fe}_3\text{O}_4$ . The reaction of  $\text{CaS}$  and  $\text{SO}_2$  can also be accelerated by the addn. of  $\text{Fe}_3\text{O}_4$ , due perhaps to the formation of an intermediate compd. of  $\text{CaO}$  and  $\text{FeS}$  which then reacts with  $\text{SO}_2$ .

C. C. DAVIS

**Hydration of meta- and pyro-phosphoric acids.** L. PESSEL. *Monatsh.* 43, 601–14 (1923).— $\text{HPO}_3$  was prepd. by adding  $\text{P}_2\text{O}_5$  in small portions to  $\text{CO}_2$ -free water at  $0^\circ$  (condition for min. content in  $\text{H}_3\text{PO}_4$ ).  $\text{H}_4\text{P}_2\text{O}_7$  was prepd. by decomp. the Pb salt by  $\text{H}_2\text{S}$  and evap. at room temp. *in vacuo* over  $\text{H}_2\text{SO}_4$ . The cryst. product melted at about  $70^\circ$  and was 79.8%  $\text{H}_4\text{P}_2\text{O}_7$  and 20.2%  $\text{H}_3\text{PO}_4$ . The hydration velocities of the acids, alone and in presence of varying amts. of  $\text{HCl}$ , were measured at  $25^\circ$ . For  $\text{HPO}_3$  the reaction velocity increased proportionally to the concn. of  $\text{H}^+$  ion, although considerable differences from true proportionality occurred. In about half the expts. the velocity const. showed a decreasing course; this is ascribed to presence of various polymers of  $\text{HPO}_3$ . Occurrence of  $\text{H}_4\text{P}_2\text{O}_7$  as an intermediate product could not be established. Confirming Sabatier (*Compt. rend.* 106, 63; 108, 804 (1888–9)) the change of  $\text{NaPO}_3$  to orthophosphate was found to be accelerated by alkali and to increase with concn. of  $\text{OH}^-$  ion. For the hydration of  $\text{H}_4\text{P}_2\text{O}_7$  a similar apparent proportionality, although with even greater differences, to the concn. of  $\text{H}^+$  ion was found. Mixts. of  $\text{H}_4\text{P}_2\text{O}_7$  and  $\text{HCl}$  showed abnormally small cond.; this is ascribed to formation of a compd. between the two acids. At  $25^\circ$  in more than 6 mos. no change of  $\text{Na}_2\text{P}_2\text{O}_7$  soln. to orthophosphate, when alone or in contact with  $\text{NaOH}$  could be observed. Contrary to Montemartini and Egidi (*Gazz. chim. ital.* 31, 394; 32, 381; 33, 52 (1901–3)) the velocity of hydration is considerably smaller for  $\text{H}_4\text{P}_2\text{O}_7$  than for  $\text{HPO}_3$ . Their velocity const. for  $\text{HPO}_3$  was confirmed; that for  $\text{H}_4\text{P}_2\text{O}_7$  is much too high.

A. R. MIDDLETON

**Hydrogen sulfates of the alkali metals and ammonium.** H. B. DUNNICIFF. *J. Chem. Soc.* 123, 731–8 (1923); cf. C. A. 14, 3203.—The small fall in acidity shown by  $\text{KHSO}_4$ ,  $\text{Na}_2\text{H}(\text{SO}_4)_2$  and  $(\text{NH}_4)_2\text{H}(\text{SO}_4)_2$  when treated with dry  $\text{EtOH}$  was earlier ascribed to presence of traces of water in the  $\text{EtOH}$ . This view is now revised and several lines of evidence are presented that it is a normal reaction and not due to moisture. The observed facts are explainable if the hydrogen sulfates are regarded as composed of two components,  $\text{M}_2\text{SO}_4$  and  $\text{H}_2\text{SO}_4$ , with which  $\text{EtOH}$  forms a ternary system.  $\text{EtOH}$  gradually and continuously removes acid from the solid phase, forming one of two new solid phases and a liquid phase, until a definite concn. of  $\text{H}_2\text{SO}_4$  in  $\text{EtOH}$  is reached which is in equil. with the solid phases. A study of various hydrogen sulfates is reported upon the basis of which they are classified as follows: (1) Converted to neutral sulfate by  $\text{EtOH}$  or  $\text{Et}_2\text{O}$  [Li, Ag, Sr, Ba]; (2) converted to  $\text{M}_2\text{H}(\text{SO}_4)_2$  by  $\text{EtOH}$  (5–7 pts.) [Na,  $\text{NH}_4$ ]; unaffected by  $\text{Et}_2\text{O}$ ; (3) slightly affected by  $\text{EtOH}$  (7 pts.), unaffected by  $\text{Et}_2\text{O}$  [ $\text{KHSO}_4$ ,  $\text{Na}_2\text{H}(\text{SO}_4)_2$ ,  $(\text{NH}_4)_2\text{H}(\text{SO}_4)_2$ ]; (4) not appreciably affected by  $\text{EtOH}$  or  $\text{Et}_2\text{O}$  [ $\text{RbHSO}_4$  and  $\text{CsHSO}_4$ ]. The hydrogen sulfates of classes (1) and (2) are deliquescent; those of (3) and (4) are not deliquescent.

A. R. MIDDLETON

**The acid decomposition of metallographically defined iron and manganese carbide alloys.** R. SCHENCK, J. GIESEN AND F. WALTER. *Z. anorg. allgem. Chem.* 127, 101–22 (1923).—Four Fe-C and four Fe-Mn-C alloys were investigated. The alloy was dissolved in pure  $\text{HCl}$  and the hydrocarbons evolved were isolated and identified by three different methods: (1) bromination, (2) condensation by liquid air, and (3) absorption by active charcoal. Qualitatively the reaction products of pure Fe-C alloys and those of low Mn content are similar. The principal products are dimethyl-ethylene, ethylene and the higher olefins as well as both the satd. hydrocarbons methane and ethane. The reaction products of Fe-Mn-C alloys rich in Mn differ in that octene preponderates, while still higher olefins such as decene and eicosene appear. Ethane, ethylene and amylene could not be detected. The quant. relations of the various hydrocarbons are given for the eight different types of alloys.

L. T. FAIRHALL

The precipitation reactions of nickel and cobalt sulfate solutions at 100° with zinc and with cadmium. ROBERT KREMANN, FRANZ ANGELBERGER, BALKALARZ, RUDOLF RÖHRICH AND CAMILLO STÖGER. *Z. anorg. allgem. Chem.* **127**, 316-42(1923).—Metallic ppts. formed from NiSO<sub>4</sub> or CoSO<sub>4</sub> by Zn or by Cd, surrounding the Zn or Cd core are not pure Ni or Co, but alloys which vary in compn. at different points. At low temps. the pptn. of Ni or Co and the formation of a Zn or Cd alloy occur at first on the surface of the Zn or Cd at a rate slower than the soln. of the Zn or Cd, with formation of hydroxides. But at 100° the rate increases and only a small amt. of hydroxides is formed. In all 4 pptns. the amt. of hydroxide decreases with increasing ratio of Ni or Co to Zn or Cd. The amt. of hydroxide is greater with Cd than with Zn, and with NiSO<sub>4</sub> than with CoSO<sub>4</sub>, and it increases with the time of reaction. The amt. of Ni or Co pptd. by Zn or by Cd increases with the time of reaction and with the ratio of Ni or Co in soln. to the effective surface of Zn or Cd. C. C. DAVIS

Complexes in solutions of copper and cobalt salts. H. G. DENHAM AND S. W. PENNYCURCK. *J. Am. Chem. Soc.* **45**, 1353-7(1923).—Expts. have been carried out with a view of throwing light on the differential behavior of salts of Al and Zn when added to solns. of Co and Cu salts. The ionic concn. ("activity") of the Co or Cu was detd. by e. m. f. measurements. Analysis of the results of these measurements fails to reveal any striking difference between the behavior of Zn and Al, but appears to indicate that another factor is also at work, which may be hydration. H. JERMAIN CRRIGHTON

Action of mercuric oxide on sulfur monochloride. GIUSEPPE ODDO AND UGO GLACHERY. *Gazz. chim. ital.* **53**, 63-4(1923).—No one has apparently previously tested the action of HgO on S<sub>2</sub>Cl<sub>2</sub>. When HgO is added bit by bit to S<sub>2</sub>Cl<sub>2</sub> in the proportions required by 2HgO + 2S<sub>2</sub>Cl<sub>2</sub> → 2HgCl<sub>2</sub> + SO<sub>2</sub> + 3S they react as indicated. Much heat is evolved. The mixt. was finally heated 41 hrs. on the H<sub>2</sub>O bath under an air-cooled condenser until SO<sub>2</sub> was no longer evolved. The white yellow mass was extd. with boiling H<sub>2</sub>O and gave nearly a quant. yield of HgCl<sub>2</sub>. E. J. WITZEMANN

The structure of Na chlorate (WULFF) 2. The space lattice of Cd oxide (SCHERRER) 2.

## 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

A systematic method for the detection of the principal anions. L. FERNANDEZ AND U. GATTI. *Gazz. chim. ital.* **53**, 108-14(1923).—According to this scheme, the details of which cannot be given here, the anions are divided into 6 groups and special tests for CO<sub>3</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup> and AcOH<sup>-</sup> are made on the original substance. Group I is formed by adding Mg(NO<sub>3</sub>)<sub>2</sub> and NH<sub>4</sub>NO<sub>3</sub> to the soln. of Na salts obtained by boiling with Na<sub>2</sub>CO<sub>3</sub>, neutralizing the excess reagent with AcOH and making faintly ammoniacal. The anions of Group I are PO<sub>4</sub><sup>3-</sup>, PO<sub>3</sub><sup>3-</sup>, AsO<sub>4</sub><sup>3-</sup>, AsO<sub>3</sub><sup>3-</sup>, F<sup>-</sup> and SiO<sub>3</sub><sup>2-</sup>. In the filtrate from Group I, NH<sub>4</sub>NO<sub>3</sub> throws down a white ppt. if Fe(CN)<sub>6</sub><sup>4-</sup> is present. Group II is obtained by boiling the filtrate with Cu(NO<sub>3</sub>)<sub>2</sub> soln. and the Ca ppt. contains SO<sub>3</sub><sup>2-</sup>, MoO<sub>4</sub><sup>2-</sup>, WO<sub>4</sub><sup>2-</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, C<sub>4</sub>H<sub>4</sub>O<sub>6</sub><sup>2-</sup> and citrate. Group III is obtained by adding Ba(NO<sub>3</sub>)<sub>2</sub> which forms insol. salts with SO<sub>4</sub><sup>2-</sup>, CrO<sub>4</sub><sup>2-</sup> and S<sub>2</sub>O<sub>3</sub><sup>2-</sup>. Group IV is obtained by adding Hg<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub> soln. which ppts. VO<sub>4</sub><sup>3-</sup> and Fe(CN)<sub>6</sub><sup>4-</sup>. Group V is obtained with the aid of AgNO<sub>3</sub> and contains Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup> and CNS<sup>-</sup>. In group VI are the acids not mentioned above, CN<sup>-</sup>, BO<sub>2</sub><sup>-</sup>, PO<sub>2</sub><sup>3-</sup>, ClO<sub>2</sub><sup>-</sup>, ClO<sub>4</sub><sup>-</sup>, NO<sub>2</sub><sup>-</sup>, C<sub>6</sub>H<sub>5</sub>CO<sub>2</sub><sup>-</sup> and C<sub>6</sub>H<sub>4</sub>(OH)CO<sub>2</sub><sup>-</sup>. E. J. WITZEMANN

The aging of thiosulfate solutions. E. ABEL. *Ber.* **56B**, 1076-9(1923).—The literature is full of contradictions regarding the stability of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> solns. used in quant. analysis. It is suggested that one possible cause of difficulty is the use of distd. water contg. a trace of Cu which catalyzes the oxidation of thiosulfate to tetrathionate by atmospheric O<sub>2</sub>. For this reason water distd. from glass is advised for making up the Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> standard soln. W. T. HALL

Lime water and its application in volumetric analysis. O. SCHMATOLLA. *Pharm. Zentralhalle* **64**, 193-5(1923).—A plea for its more extended use as a standard alkali. W. O. E.

Determination of antimony by means of phenylthiohydantoic acid. MME. AND M. A. LASSIUR. *Compt. rend.* **176**, 1221-3(1923).—Willard and Hall (*C. A.* **16**, 3826-7) have proposed the use of phenylthiohydantoic acid for the detn. of Cu and Co and mentioned the fact that similar insol. compds. are formed with Pb, Ag, Cd, Bi and

Sb as well. In this paper an easy method for preparing the reagent is described and a method for detg. Sb outlined. The method was tested with solns. of tartar emetic and found accurate. To 150 cc. of soln. contg. 0.065 g. Sb or less, add 5 cc. of *N* AcOH and 0.5 g. of the solid reagent. Heat to boiling and in 2-3 mins. a ppt. will form. Boil 2 or 3 mins. longer, filter through a Gooch crucible and wash with a little water. Place the ppt. and asbestos in a beaker and dissolve with 20 cc. of hot alc. Add 1 cc. of glacial AcOH and a little  $\text{Na}_2\text{S}$  soln. Filter off the ppt. of  $\text{Sb}_2\text{S}_3$ . Dissolve this ppt. by pouring four 20-cc. portions of hot  $\text{Na}_2\text{S}$  soln. through the filter and finally wash with 60 cc. more of water. Add 5 g. KCN and electrolyze at  $70^\circ$  for Sb. W. T. HALL.

**Analysis of Alsatian potash salts by the Przibylla method.** PAUL HUBERT. *Chimie et industrie* 9, 665-70(1923); cf. *C. A.* 17, 509.—More details are given than in the first article. A. PAPINEAU-COUTURE.

**The assay of nitrates by titration with ferrous sulfate.** JULES R. LORTSCH. *Caliche* 4, 208-15(1922).—A discussion of the errors involved in detg. nitrates in caliche.

**The determination of potassium in Chilean salitre.** FRASER AND SOUTHWARD. *Caliche* 4, 216-8(1922).—The writers obtained concordant results by pptg. the K as  $\text{K}_2\text{NaCo}(\text{NO}_2)_6$ . E. S. FREED.

**Estimation of arsenic in organic compounds.** R. STOLLÉ AND O. FECHTIG. *Ber. pharm. Ges.* 33, 5-9(1923).—Heat 0.2 g. of sample and 7 g. of powdered  $\text{KNO}_3$  with 15 cc. of concd.  $\text{H}_2\text{SO}_4$ . After 1 hr. add 1 g. of  $\text{KNO}_3$  and continue heating until the temp. reaches about  $350^\circ$ . Add 3 g.  $(\text{NH}_4)_2\text{SO}_4$  and heat 15 mins. more. Cool, dil. with 50 cc. of water, add 1.5 g. of KI and titrate with  $\text{Na}_2\text{S}_2\text{O}_3$ . As a check, nearly neutralize with soda, add an excess of  $\text{NaHCO}_3$  and titrate with  $\text{I}_2$ . E. RUPP. *Ibid* 97.—Polemic. W. O. E.

**The gravimetric determination of organic phosphorus.** W. JONES AND M. E. PERKINS. *J. Biol. Chem.* 55, 343-51(1923).—Heat 0.3-0.5 g. of material with 10 cc. of concd.  $\text{H}_2\text{SO}_4$ , 7.5 g. of  $\text{K}_2\text{SO}_4$  and 5 drops of 10%  $\text{CuSO}_4$  soln. After the decomposition is complete, dil. to 200 cc., add 4 g. of  $\text{NH}_4\text{NO}_3$  and ppt. with 4%  $(\text{NH}_4)_2\text{MoO}_4$  soln. Dissolve the ppt. in  $\text{NH}_4\text{OH}$  and transform the P into  $\text{Mg}_2\text{P}_2\text{O}_7$  in the usual way. The properties of the ppts. and details of the procedure are given. A. P. LOTHROP.

**Analysis of "solidified" glycerols.** CATTELAÏN. *J. pharm. chim.* 27, 365-8(1923).—The material referred to is made from gelatin and glycerol and is used for printers' rollers, etc. It should m. at  $35-45^\circ$ . Some idea as to whether pure gelatin and pure glycerol were used may be obtained by detg. the acidity. Gelatin should contain acid equivalent to 0.5-1.5% HCl and 50 cc. of good glycerol should react with 0.3-0.6 cc. of 0.1 *N* NaOH. In the ash, det. CaO,  $\text{Fe}_2\text{O}_3$ ,  $\text{P}_2\text{O}_5$  and  $\text{SO}_3$ . Good gelatin contains 0.5% CaO; more than traces of  $\text{P}_2\text{O}_5$  indicate that a pure grade of gelatin was used. Kaolin and  $\text{BaSO}_4$  should be looked for in the ash. Also det. Cl, calc. as CaCl<sub>2</sub>; best gelatins have a max. of only 0.02%. To det.  $\text{H}_2\text{O}$ , melt 10 g. by gentle heat, then keep at  $80^\circ$  for 3 hrs., renewing the surface often. Cool *in vacuo* over  $\text{H}_2\text{SO}_4$ , weigh rapidly. This method avoids evapn. of glycerol. For detg. glycerol, mix 10 g. with 60 g. calcined  $\text{Na}_2\text{SO}_4$ , leave in desiccator for 48 hrs., add to the powdered friable mass 100 cc. of dried acetone, boil for 1 hr. at reflux, then cool and add acetone to restore total wt., and filter rapidly. Collect 50 cc., evap., dry at  $50^\circ$  and weigh. To check the result, take up the residue with 20 cc.  $\text{AcOEt}$ , evap. and dry as before. Detg. gelatin the Kjeldahl method (50 cc.  $\text{H}_2\text{SO}_4$  : 5 g. substance) gave 16-16.5% N based on hydrous, pure gelatin (10%  $\text{H}_2\text{O}$  after 48 hrs. over  $\text{H}_2\text{SO}_4$ ). To det. sucrose, melt 10 g. of the substance, dil. with a 50% glycerol- $\text{H}_2\text{O}$  mixt., and gradually add a mixt. of equal wts. of calcined  $\text{Na}_2\text{SO}_4$  and quartz sand, leave in desiccator for 48 hrs., powder and exhaust in 3 steps with a total of 200 cc. 95% EtOH. Filter, distil off the EtOH, take up the residue with 90 cc.  $\text{H}_2\text{O}$ , invert by warming for 5 min. with 5 cc. of 5% HCl, cool, complete to 100 cc., filter from traces of gelatin and det. sucrose as usual. Gelose (cf. *C. A.* 6, 2267) is best detected by the method of Trillat and Desmoulières (1902); the presence of glycerol does not interfere. S. WALDBOTT.

**Action of iodine on some substituted semicarbazides; applied to their determination.** A. DOUCET. *J. pharm. chim.* 27, 361-5(1923).—With semicarbazide (A) substituted in 1, *e. g.*,  $\text{C}_6\text{H}_5\text{NH.NH.CONH}_2$  (B), I does not liberate N as with A; 1 mol. of B consumes a total of  $\text{I}_2$ , of which  $\text{I}_2$  forms 2HI and  $\text{C}_6\text{H}_5\text{N:NCONH}_2$  (C), m.  $114^\circ$ ; then C forms an unstable addition compd. with I. For quant. detn. of B, dissolve 0.2 g. B with 1 g. NaAcO in 10 cc. EtOH, add 50 cc. 0.1 *N* I; after 10 min., add 50 cc. of 0.1 *N*  $\text{Na}_2\text{S}_2\text{O}_3$  and titrate back with 0.1 *N* I in presence of starch paste. 1 mol. of B is equiv. to  $\text{I}_2$ . In check expts., the exact amt. used was recovered. Similarly, I acts on *m*- $\text{NH}_2\text{CO.C}_6\text{H}_4\text{NH.NHCONH}_2$  (D) forming 2HI and *m*- $\text{NH}_2\text{COC}_6\text{H}_4\text{N:NCONH}_2$  (E). To 100

cc. of a satd. aq. soln. of *D* add 5 cc. NaAcO and an excess of concd. I soln. (5 g. I, 10 g. KI, 20 cc. H<sub>2</sub>O). An addn. compd. is pptd. Dissolve the excess of I with excess of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> soln.; an orange-colored cryst. ppt. of *E* is formed. Recrystd. from EtOH, m. 186° without decompn. *E* is stable in air, its soly. is 3.25% in boiling H<sub>2</sub>O, 2.20% in hot EtOH, 0.8% in acetone (15°), 0.7% EtOH (15°), 0.07% H<sub>2</sub>O (15°); insol. in Et<sub>2</sub>O, CHCl<sub>3</sub>, C<sub>2</sub>H<sub>6</sub>; thus it differs from *C* which is very sol. in these solvents. The quant. detn. of *D* is conducted in the same way as that for *B*. S. WALDBOTT

Analysis of bauxite (CASTELLI) 8. Sublimation as an analytical procedure (HORTVET) 1.

## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND EDW. F. HOLDEN

A practical procedure for the analysis of bauxite. G. CASTELLI. *Rass. min. met. chim.* 58, 62-5(1923).—The standard procedure of English metallurgical labs. for detg. H<sub>2</sub>O, ignition loss, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, CaO, MgO, K<sub>2</sub>O, Na<sub>2</sub>O, P and S is given, with typical analyses of bauxite from several countries. C. C. DAVIS

Chemical investigation of Japanese minerals containing rarer elements. V. Analysis of beryl of Ishikawa, Iwaki province. TAKU UYEMURA. *J. Chem. Soc. Japan* 44, 296-302(1923).—Unlike Naegi beryl (*C. A.* 16, 1921), the Ishikawa product is non-transparent, and is larger. The sample analyzed had d. 2.8. The same method of analysis was used, except that Copaux's method of detg. Be could not be applied to this beryl. The results were: SiO<sub>2</sub> 49.60, BeO 19.31, Fe<sub>2</sub>O<sub>3</sub> 0.11, Al<sub>2</sub>O<sub>3</sub> 24.09, CaO 0.79, MgO 0.14, loss on ignition 2.81, alk. (as Na<sub>2</sub>O) 3.65%. It therefore corresponds to 4BeO·Al<sub>2</sub>O<sub>3</sub>·4SiO<sub>2</sub>; a probable structural formula is suggested with one Si in the form of orthosilicic acid. This may be responsible for the difficulty of detg. Be by Copaux's method. Spectrum analysis is also given. Unlike the beryl of Naegi, U. found no Cr line in the Al portion. S. T.

Mendeleefite, a new radioactive mineral. V. I. VERNADSKII. *Compt. rend.* 176, 993-4(1923); cf. *C. A.* 16, 2568.—The name, mendeleefite, has been given to a radioactive mineral discovered in Transbaikalia by K. Egoroff and M. Jakunine. It is a uranotitanocolumbate of Ca (23.5% U<sub>3</sub>O<sub>8</sub> and 15% CaO approx.), contg. small amts. of rare earths. The crystals are rhombodecahedrons (110) truncated by (111). The hardness is 4.5 and sp. gr. is 4.758. It may be considered a variety of betaïte, but it contains no water of crystn. and its color is submetallic and grayish black, while betaïte is greenish yellow. D. C. BARDWELL

Recent formation of blue basic ferro-ferriphosphate (vivianite) on and in earth clods of a cultivated field. H. KUNZ-KRAUSE. *Ber. pharm. Ges.* 33, 20-5(1923).—A detailed discussion of the possible stages involved in the formation of this substance from various ingredients of the soil. W. O. E.

Iron-ore deposits of Southern Utah. D. P. ROHLFING. *Eng. Mining J. Press* 115, 716-9(1923).—The chief Fe ore deposits of Utah are situated in the south-central part of Iron County, about 250 miles from Salt Lake City. Recently a steel corporation has acquired some of the larger properties and is ready to begin operations, planning to build blast furnaces to make pig Fe. R. describes the geology of the occurrences. H. C. PARISH

Magnesite deposits of Grenville, Quebec. G. W. BAIN. *Trans. Am. Inst. Mining Met. Eng.* No. 1244M, 19 pp.(1923).—Magnesite and dolomite, both mineral and rock, occur in the Grenville limestone associated with gneisses and dikes. The deposits are found only beneath impervious dikes and on or near the crests of anticlines. They were probably formed by replacement, by means of hot Mg-bearing waters from a granite magma. E. F. H.

Report on Texas alkali lakes. C. C. MEIGS, H. P. BASSETT AND G. B. SLAUGHTER. *Univ. of Texas Bull.* No. 2234, 59 pp.(1922).—Other K deposits of the country are critically reviewed. The brines described are in Lynn, Terry, Hockley, Lamb, Bailey and Cochran Cos. The "lakes" are depressions formed by the removal, by soln., of salt beds from underlying Permian beds. They are filled with silt containing brine and salt crystals, fed by springs coming from the Permian strata. Salt, K, and Mg are the valuable constituents of the brines. A large number of analyses and logs of wells are given. Much of the paper consists of recommendations for the process to be used, and cost ests. E. F. H.

**The occurrence of pure quartz in Krødsherred.** OLAF ANDERSEN. *Norg. Geol. Undersøkelse, Statens Raastofkomite Publication No. 3*, 19 pp. (1922).—A large deposit of comparatively pure quartz is located near Lake Krøderen in Southern Norway. The amt. available within 5 meters of the surface is estd. at 500,000 tons. It is coarse grained and contains liquid inclusions. The impurities present in small amts. are microcline, oligoclase-albite, muscovite, biotite, and magnetite. The quartz contains insignificant amts. of gold and silver. J. A. ALMQUIST

**The formation of petroleum deposits.** F. TRAUTH. *Petroleum Z.* 19, 331-4 (1923).—The conditions associated with the occurrence of petroleum in the Carpathians are (1) presence of "Fylsch or Fylschoid," rock formations from whose org. material hydrocarbons originate, (2) an impenetrable rock layer which cuts off the gas and liquid from above, (3) the oil is cut off on both sides by intensive faulting, the oil congregating at the tips of the anticlines, (4) a series of secondary anticlines of the same nature but smaller in size below the upper anticlines. D. F. BROWN

**Theories on mineral oils.** E. CORTESE. *Rass. min. met. chim.* 58, 51-60 (1923).—Petroleum is thought to be of mineral origin; it is almost never found in the rocks in which it originated. After formation from carbonates by  $H_2S$ , it migrates or ascends from its source, losing its lighter constituents on account of porosity, and different grades are found in proximity, though from the same source. Much evidence is offered against the org. origin of petroleum and the inorg. theory, already suggested by C. (cf. *C. A.* 15, 354) and amplified later (cf. *Miniera ital.* Jan. 1922), is explained with numerous chem. reactions. The various theories to explain the occurrence of salts with hydrocarbons are discussed and the theory already proposed by C. is defended (cf. *C. A.* 17, 709). On these assumptions and from the known geology of Italy, enormous sources of petroleum are probably present at a depth not yet reached, but not too great for exploitation. C. C. DAVIS

**The oil deposits of the Magdalena Valley, Colombia.** O. STUTZER. *Petroleum Z.* 19, 407-12 (1923).—The 5 main oil fields of Colombia are those in the region of the Caribbean Sea, the Pacific Coast region, the Magdalena Valley, the region of the Venezuela border and at the foot of the East Cordillera in the Llanos. A brief description is given of each field, together with a detailed description of the geological features of the Magdalena Valley. D. F. BROWN

**Palagonite-bearing dolerite from Nagpur.** Suggestion regarding the nature of palagonite. D. N. WADIA. *J. Proc. Asiatic Bengal, 8th Indian Sci. Cong.* 17, 100-1 (1922).—Palagonite occurs as lacunae in an orthoclase-bearing dolerite as a zeolitic infiltration product with concentric rings of growth, and irregular patches among augite and magnetite crystals. The lacunae are stopped by an amorphous, black, brittle, fissured, glassy, isotropic substance, which in thin flakes is orange or green with conchoidal fracture and resinous or vitreous luster. The black color is due to an external coat of Fe, and on removal by acids leaves a colorless translucent Al silicate contg. MgO and CaO. The palagonite is probably formed from the decompn. of magnetite and augite. C. C. DAVIS

**The chemical composition of the coral of Tirreno.** N. PASSERINI. *Gazz. chim. ital.* 53, 35-40 (1923).—That *Corallium rubrum* Lam. (*Isis nobilis* Pall.) is mainly composed of  $CaCO_3$  has long been known, but few quant. analyses are in existence. On analysis P. found  $H_2O$  0.600, org. matter 2.545,  $CaCO_3$  85.495,  $MgCO_3$  9.102,  $CaSO_4$  1.230, other mineral constituents and losses 1.028%. There is less than 3.6 mg.  $Fe_2O_3$  in 100 g. of coral, in spite of previous reports. 0.22%  $Al_2O_3$  was present and easily detected. The nature of the red color was not detd. For details see the original. E. J. WITZEMANN

The structure of Na chlorate (WULFF) 2. The space lattice of Cd oxide (SCHERRER) 2.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

**Cadmium in 1922.** C. E. SIEBENTHAL AND A. STOLL. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1922, Part I, 1-5 (Preprint No. 1, published May 22, 1923). E. H.

**Tantalum and its technical uses.** S. L. MALOWAN. *Edel Erden u. Erze* 4, 26-8 (1923).—After a brief history of the discovery and first isolation of the metal, the method



of reduction and uses are given. The high m. p. of Ta makes it adaptable for light bulbs in place of W; the life of these lamps is about 1,000 hrs. The metal is also used for instruments in the medical and dental professions because of its hardness and resistance to common acids.

W. A. MUELLER

**The Replogle magnetic tailing re-treatment plant.** W. R. CANTON. *Eng. Mining J.-Press* 115, 849-50(1923).—Fe ore concd. magnetically during the war at this mine near Wharton, N. J., gave a tailing carrying 25% Fe, due to the presence of non-magnetic martite and the lack of fine grinding. In the new mill this tailing is dried, screened, re-ground, treated by magnetic sepn., and the pulp concd. with tables and classifiers.

A. BUTTS

**The new magnetic concentrating mill at the Richard iron mine, New Jersey.** H. M. ROCHE. *Eng. Mining J.-Press* 115, 923-32(1923).—Fe ore has been mined in this district for 200 yrs., with a total output of 30,000,000 tons from 366 mines. With recent improvements in mining and milling there has been a revival of activity and old mines are being reopened. A detailed description is given of the new Richard mill, with diagrams and flow sheet.

A. BUTTS

**Magnetic separation of complex lead-zinc ores.** E. HEDBURG. *Eng. Mining J.-Press* 115, 920-1(1923).—Flotation concentrates are not well suited for Zn smelting, and selective flotation of complex ores is often unsuccessful. A "hydromagnetic" process is recommended, in which the ore is crushed, jigged, and given a magnetizing roast. The roasted ore passes through a spray of crude oil which reduces and renders magnetic the Fe-Cu minerals without affecting the Zn. It is then sepd. magnetically while still hot, giving a Pb-Ag, and Fe-Cu-Au, and a clean Zn concentrate, the last carrying up to 60% Zn.

A. BUTTS

**Cyaniding gold ore at the Ashanti mine.** ANON. *Eng. Mining J.-Press* 115, 844-6(1923).—The process involving roasting used since 1909 was abandoned in 1922 owing to shortage of fuel. The new process will be more economical in spite of a falling-off in total extn. from 90 to 80%. It includes amalgamation of the free Au and sep. cyaniding of a roasted concentrate, raw sand, and raw slime. Flow sheets are given showing the present practice and improvements to be adopted. The latter include a post-treatment to recover a certain amt. of Au which is pptd. by graphite present in the ore. This treatment consists of leaching the cyanided residue with Na<sub>2</sub>S soln., then pptg. the dissolved Au on Cu shavings.

A. BUTTS

**Regeneration of cyanide solutions.** H. B. WRIGHT. *Eng. Mining J.-Press* 115, 806-8(1923).—Owing to presence of the cyanicides Cu, Pb, and Bi in the tailings dump at the Mitchell's Creek Au mine, N. S. W., ordinary cyanidation was impracticable. A process was developed in which 3.2 lb. of CaO per ton was mixed with the sand going to the vats to neutralize latent acidity, and Ca(OH)<sub>2</sub> was added to solns. charged with HCN, regenerating NaCN. Strong solns. were pptd. in Zn boxes, but weak solns. were treated with H<sub>2</sub>SO<sub>4</sub>, pptg. Cu as CuCN along with Au and Ag. Not enough HCN was liberated to cause trouble. Of the total NaCN used, 52% was regenerated; a cost of £608 was involved, while NaCN recovered was worth £1521 and in addition Cu valued at £335 was obtained.

A. BUTTS

**The Wright-Hargreaves cyanide mill.** J. E. GRANT. *Eng. Mining J.-Press* 115, 883-6(1923).—A description of a new 200-ton mill at Kirkland Lake, Ont., treating \$12 Au ore by all-cyanidation. A feature is the use of special air agitation in the thickeners to prevent the agglomeration of the ore in a pasty mass.

A. BUTTS

**Amalgamation and all-cyanidation.** HENRY HANSON. *Eng. Mining J.-Press* 115, 896(1923).—The advantages claimed for each of these processes are outlined. In the Porcupine district, Ont., all plants which have started since all-cyanidation was introduced are using that method.

A. BUTTS

**Increase of sulfur in the cupola.** RICHARD WALTER. *Giesserei-Ztg.* 19, No. 34, 1 p.; *Bull. Cleveland Tech. Inst.* 1, No. 12, 29(1922).—It has been found that iron contg. about 0.15% S will take up little or no more S in the cupola. In this way the use of the worst type of foundry coke would not have any influence on this impurity in the cupola.

W. A. MUELLER

**Elimination of gas regenerator chambers in the open-hearth process.** WILLIS MCKEE. *Foundry Trade J.* 26, No. 315, 1 p.; *Bull. Cleveland Tech. Inst.* 1, No. 12, 49(1922).—The producers are placed near the furnaces and the pipes well insulated to the ends of the furnace and introduced into the uptakes without any regeneration. These are only used where mixing can be accomplished before issuing from the ports. The great advantage is the elimination of gas losses due to reversing, lower cost and predicted fuel economy.

W. A. MUELLER

**Reactivity of coke as a factor in the fuel economy of the blast-furnace.** E. R.

SUTCLIFFE, E. C. EVANS AND R. V. WHEELER. *J. Iron and Steel Inst.* (advance proof), May 1923, 52 pp.—An extensive review is given of the theories and practice proposed for fuel economy. Data are cited to demonstrate that the highest efficiency comes from the use of reactive coke with partial reduction of the  $\text{Fe}_2\text{O}_3$  by C in the stack. The activation of coke and its resulting characteristics are described (cf. C. A. 16, 2588, 2975) and also the detn. of its reactivity. G. R. FONDA

Some effects of zirconium in steel. F. M. BECKETT. *Iron Age* 111, 1321-3 (1923).—Zr is a better deoxidizer and scavenger than Si. Its effect on S, hot rolling properties, and on heat-treated steels is briefly outlined. A detailed discussion will follow. P. W. COBB

Tungsten high-speed steel. ALF. BANG. *Jernindustri* 3, 119 (1922).—A special high-speed steel, "Nansen," contg. 18% W is manufd. at Stavanger Elektrostaalverk from pure scrap-steel and P- and S-free cast iron. The materials are fused in an elec. arc furnace and tapped into an induction furnace. The P and S contents are brought down to 0.010-0.002% and W is added in accurate amts. The temp. may be regulated within a few degrees. The ingots are worked by hammering only, never by rolling. The forging temp. is of great importance; it must be kept between 950° and 1050°. Properly hardened this steel will remain hard even at a faint red heat. CHR. H. A. SYVERTSEN

Methods and apparatus used for the determination of the critical points of metals and alloys. PIERRE DEJEAN. *Chimie et industrie* 9, 654-64, 883-900 (1923).—A review with bibliography. A. PAPINEAU-COUTURE

Corrosion of rust-proofed iron and steel. W. P. WOOD. *Chem. Met. Eng.* 28, 769-72 (1923).—Samples of open-hearth iron, wrought iron, copper steel and open-hearth steel were tested uncoated and after having undergone various rust-proofing processes. Tests were carried out in slowly moving water, satd. with O. The presence of O apparently causes an exaggerated initial corrosion in iron and low-C steel. A small amt. of Cl in tap water causes a slight increase in corrosion rates of immersed metals. The Cu content of iron and steel does not affect the corrosion rate. Different surface conditions of a metal tend to become equalized over a period of time and the corrosion rates to become steady and uniform when large amts. of O are present. O does not appear to increase pitting. Galvanizing seems to be the best means of preventing corrosion. F. W. COBB

Experiments with rare metals in steels: uranium, boron, titanium, zirconium, cerium, and molybdenum. H. W. GILLET AND E. L. MACK. *Trans. Am. Electrochem. Soc.* 43, preprint (1923); cf. C. A. 16, 4169.—Of the elements U, B, Ti, Zr, Ce, and Mo added to exptl. heats of steels only Mo has a decided and consistently beneficial effect. U probably has a slight strengthening effect. B and Ce are harmful. Ti and Zr have about as much effect as equal amts. of Si. Mo is a real and potent alloying element. Its most important effect is in the control it gives of the development by heat treatment of the properties desired. It tends to make the steel require less drastic quenching and to make it harden to a greater depth on a given quench. While the exaggerated claims for Mo in steel in regard to endurance cannot be corroborated, it seems that a well made Mo steel is at least as good in endurance as any other well made steel. LOUIS JORDAN

Roman Iron. BERNHARD NEUMANN. *Z. Elektrochem.* 29, 175-9 (1923).—A brief account is given of the results of analyses and photomicrographic exams. of Roman Fe. The results obtained indicate that the Romans carbonized soft bloom Fe for certain purposes (e. g., making knives) by local cementation. H. JERMAIN CREIGHTON

The large place taken by alloy steels. J. K. SMITH. *Iron Age* 111, 1621-3 (1923).—The more recent developments in connection with V, Cr, W and Mo are discussed. A complete and correct definition of steel cannot be given. The most satisfactory working definition is "steel is a compd. of Fe with more or less C, which can be wrought and shaped plastically when solid and red-hot and which in the last stage of its prepn. previous to fabrication has been cast from a completely fluid condition." E. H.

Investigations on platinum metals at the Bureau of Standards. EDWARD WICKERS AND LOUIS JORDAN. *Trans. Am. Electrochem. Soc.* 43, preprint (1923).—The investigations include the prepn. of all the metals of the Pt group in a high degree of purity, critical studies of analytical seps., the technic of melting and mech. working of the pure metals and their alloys, the study of selected alloys with respect to their suitability for Pt lab. ware, and the detn. of a variety of phys. properties of such metals and alloys. LOUIS JORDAN

White metals. A. H. MUNDY, C. C. BISSETT AND J. CARTLAND. *Metal Ind.* 21, 13-4, 62-3, 106, 191-2, 241; *Engineering* 114, 441-3 (1923).—A review. E. J. C.

**Briquetting of brass turnings.** F. L. WOLF. *Metal Ind.* 21, 188(1923).—Briquetting improves neither yield nor quality of castings. W. H. BOYNTON

**Re-silvering mirrors.** C. H. PROCTOR. *Metal Ind.* 21, 193(1923).—All old Ag must be removed and the surface of the glass made chemically clean before depositing Ag from either a tartaric acid or a Rochelle salt soln. A cloud shown on new glass to reflected light is claimed to be due to Pb and this cloud may be removed by flowing a weak HF soln. over the glass. Formulas and procedure are outlined. W. H. B.

**Preparation of Ba alloys (GOLDSCHMIDT) 4.** Electrical conductivity of some Au-Fe alloys (Example of the electrical behavior of definite mixed-crystal series) (GUERTLER, SCHULZE) 2.

**Method of flotation.** F. P. EGEBERG. *Norw.* 34,426, Mar. 27, 1922. Org. compds. contg. S and N are added to the ore, for instance thiourea, thiocyanogen compds., thioamido compds., or S derivs. of amines, etc. Only 25–40 g. per ton of ore is required.

**Ore-flotation composition.** R. LUCKENBACH. U. S. 1,457,708, June 5. Rosin pitch 5 kg., PhOH 20 l., and an alkali in alc. or acetone 10 l. mixed with warm  $H_2O$  1000 l. form a stock soln. which facilitates flotation of mineral values in ore concn. The alc. or acetone soln. of alkali may be formed of 5 g. KOH or NaOH dissolved in a l. of EtOH, MeOH or acetone. Glue or gelatin may also be added to facilitate flotation sepn. of some ores.

**Concentrating minerals by flotation.** F. P. EGEBERG. *Norw.* 35,561, Aug. 21, 1922. Toluidine in amts. varying from about 230 g. to about 680 g. per ton is added to the ore.

**Ore flotation apparatus.** T. A. JANNEY. U. S. 1,457,077, May 29.

**Flotation of oxidized ores.** W. A. WHITAKER. U. S. 1,457,680, June 5. Particles of oxidized ores such as those of Cu are prepd. for flotation by treatment with reagents such as fatty acids to form an org. film on the particles which facilitates their flotation.

**Treating siliceous ores.** G. H. WIGTON and S. M. SEDDON. U. S. 1,458,016, June 5. Oxidized siliceous ore contg. Pb, Ag and Au is subjected to gravity sepn. to remove gang, the remaining natural sulfides are removed together with precious metal values by flotation and remaining oxidized minerals, as a slurry, are fed to an oxidizing atm. and subjected to a temp. of 925–1370°; the fume is collected and the combined concentrates are smelted.

**Treating calciferous ore.** P. FARUP. *Norw.* 36,144, Nov. 6, 1922. If limey pyrite is extd. with  $H_2SO_4$  after roasting much acid is wasted as  $CaSO_4$ . This can be avoided by treating the unroasted ore with dil.  $HNO_3$  or other acids. By dividing the material into 2 different grain sizes, which are treated in different ways, it is possible to ext.  $CaCO_3$  rather completely without dissolving any considerable amt. of the pyrite. If  $HNO_3$  is used for the extn.,  $Ca(NO_3)_2$  is obtained as a by-product.

**Reduction of ores.** RAGNVALD STOREN and RRIERT JOHANSON. *Norw.* 34,884, May 8, 1922. Oxide ores, for instance iron ore in a pulverulent state, are reduced by electrolytic H in a rotary kiln at a sufficiently low temp. to obtain a pulverulent product. A C-free Fe is obtained. The H is quant. utilized by circulation under condensation of the vapor, etc.

**Treating ores containing galena.** N. C. CHRISTENSEN. U. S. 1,456,784, May 29. Ores contg. galena are treated with a concd. soln. of NaCl contg. also  $FeCl_3$  to dissolve the Pb as chloride. Cf. C. A. 17, 375.

**Centrifugal apparatus for amalgamating gold ore, etc.** H. C. TABER. U. S. 1,457,560, June 5.

**Apparatus for amalgamating ores.** H. W. RICHARDS. U. S. 1,457,635, June 5.

**Apparatus for classifying ore constituents by hydraulic separation.** A. NORIEGA. U. S. 1,456,563, May 29.

**Separating gold.** L. M. DYSON. *Brit.* 189,206, Aug. 23, 1921. Au is sepd. from auriferous gravel or like ore by treatment in a substantially horizontal rotating cylinder provided on its interior with a lining of blanket material, and with longitudinal riffles, which are preferably inclined backwards from a radial position in order to carry the auriferous pulp to the top of the cylinder and to prevent it from sliding back into the mass of ore. A suitable construction is specified.

**Extracting lead from sulfide ores.** W. H. HANNAY. U. S. 1,456,789, May 29. Ores contg. PbS are treated with NaCl and  $FeCl_3$  to dissolve the Pb as chloride and the soln. thus obtained is electrolyzed to deposit the Pb with simultaneous regeneration of the  $FeCl_3$ . The residue is washed to recover Cl.

**Metal dust by vapor condensation.** M. H. NEWELL. U. S. 1,456,035, May 22. Zn or other metal to be obtained in dust form is vaporized and the vapor is condensed in the presence of a limited regulated supply of O which serves to prevent too large particles from forming without permitting much oxidation.

**Condensing zinc vapors.** NORSK ELEKTRISK METALINDUSTRI. Norw. 36,254, Nov. 20, 1922. The condenser has a continuous oscillating, shaking or rotary motion. The Zn powder that is formed along with liquid Zn falls to the bottom of the condenser where the small particles are exposed to a rubbing, which acts to loosen the surface film consisting of ZnO, while the central nucleus of metallic Zn combines with the main liquid. The temp. in the condenser is kept somewhat above the m. p. of Zn.

**Detinning metal plates.** C. F. H. BOHNHARDT. U. S. 1,457,688, June 5. Sn-plated metal sheets are immersed in an electrolytic bath contg. materials such as  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_2\text{CO}_3$  and Na silicate, which will soften the coating, and the softened and loosened coating is removed from the plate.

**Armor plate.** F. BRADLEY and H. L. FREVERT. U. S. 1,457,101, May 29. Armor plate is treated to produce a hardened front with a carburized face and tough back and the plate is drawn at a temp. of  $260-593^\circ$  which removes from the front its hard and brittle character while maintaining sufficient of its stiffness to offer high resistance to displacement. U. S. 1,457,102 relates to a similar heat treatment of armor plate which has a tough back and a carburized hardened front to a depth of 45-65% of the thickness of the plate. U. S. 1,457,103 relates to a similar process except that the face of the plate is not carbonized.

**Recuperative furnace for heating metal billets.** N. F. EGLER. U. S. 1,456,788, May 29.

**Gas-fired regenerative furnace adapted for melting brass.** H. O. LOEBELL. U. S. 1,457,780, June 5.

**Tiltable furnace adapted for melting brass.** P. J. NUTTING and H. W. HAYWARD. U. S. 1,456,992, May 29.

**Iron manufacture.** H. D. HIBBARD. Brit. 189,622, Oct. 25, 1921. In the manuf. of wrought Fe, molten metal and oxidizing agent are poured repeatedly directly from one container to another, air being excluded, in the form of a sheet of molten metal so that by the repeated impact produced by the pouring, the Fe collects as a ball or bloom, the slag remaining in the molten state. The ball or bloom is passed from one container to another to expel the entrained slag and may be discharged to a squeezer or may be rolled while in contact with the slag until it has assumed an elongated shape. During the operation heat is supplied to maintain the temp. until the non-ferrous elements have been substantially eliminated. In making Fe of superior quality two slags are utilized, the first being poured off after the bulk of the Si, P, etc., have been eliminated, and the fresh oxidizing material together with a flux added. The process may be carried out in the furnaces described in 162,624 and 179,888.

**Iron and other metals from solutions.** D. BELCHER and F. A. EUSTIS. U. S. 1,456,615, May 29. Fe sulfide carrying other associated metals such as Cu, Au and Ag is leached with a soln. of  $\text{FeCl}_3$  and  $\text{FeCl}_2$  or other solvent to dissolve Fe together with part at least of the associated metals. Metals other than Fe are removed from the soln. by pptn., e. g., by use of Fe to ppt. Cu, together with a minor fraction of the Fe and the remaining soln. is then electrolyzed to deposit Fe.

**Making iron and steel pipes non-corrodible.** OSCAR BLICH. Norw. 36,414, Dec. 16, 1922. The articles are treated with vapors of hydrocarbons and fats at temps. above the decompn. temps. of these substances.

**Protective coating on steel.** W. J. KEEP. U. S. 1,456,274, May 22. A non-porous protective coating is formed on steel or other ferrous metals by heating at least to the m. p. of Al and dipping the metal in molten Al, removing excess Al and then heating to a temp. considerably in excess of that of the m. p. of the Al bath in contact with air. The coating thus formed is resistant to high temps.

**Coating metals with phosphides.** S. PEACOCK. U. S. 1,456,252, May 22. Metal articles such as sheets of Fe or steel are provided with a protecting film coating by treating their surfaces with a viscous mixt. formed from oil, a phosphate and charcoal and heating to a temp. of about  $875^\circ$  to form a phosphide on the surface.

**Coating metal surfaces.** J. K. WIRTH. Brit. 188,187, Oct. 22, 1921. Addition to 171,369 (C. A. 16, 995). Metal and other surfaces are first coated with a liquid phenol-aldehyde condensation product. A layer of fibers or fibrous material, which has been satd. with a moistening agent, partly dried, and coated on one side with the condensation product, is then applied to the coated metal. The material is dried at a temp. not exceeding  $60^\circ$  and then heated more strongly to harden the condensation

product, after which a further coating of phenol-aldehyde is applied to the surface of the fibrous coating and hardened. The fibers, which may be asbestos or cellulose, may be used either loose or in the form of paper or the like. The moistening agent may be  $H_2O$  or other easily drying liquid, *e. g.*, solns. of binding agents such as water glass or artificial resin, or acids or salts, such as Na sulfite,  $Na_2CO_3$ , or oxalic acid, which will accelerate the hardening of the condensation product.

**Rust preventive for use on metals.** C. C. HOWE and S. W. LIBBY. U. S. 1,457,169, May 29. A mixt. for preventing rusting of machine parts or other metal articles is formed of petrolatum 32, mineral oil 15, wool fat 32 and mica 18 parts. Small amts. of cedar oil and graphite may be added.

**Ferrovandium.** KAJIMA NISHIDA. Japan. 41,296, Dec. 27, 1921. Formerly Fe was manufd. from Fe sand and wood charcoal in the district of San-in. Slags produced in the process are now piled up and are rich in V; these slags are used as the raw material. A mixt. of 10 parts of the slag, 3 parts of soda ash, and 1 part of  $NaNO_3$  is heated in a reverberatory furnace. When the mixt. becomes fluid, it is quickly thrown into boiling  $H_2O$ , boiled, agitated, crushed, and filtered. By adding concd.  $FeSO_4$  soln. to the filtrate Fe vanadate is pptd.; it is filtered, dried, and powdered. The powder (10 parts) is mixed with 2 parts of soda ash and 1 part of  $NaNO_3$  and heated in a reverberatory furnace until it becomes fluid. It is then put into boiling water as above, boiled, agitated, crushed, and filtered. The filtrate is somewhat concd. and neutralized, by which impurities except Na vanadate are expelled and V is isolated as Fe vanadate by adding concd.  $FeSO_4$  soln. The ppt. is sepd. from the soln. and changed into ferrovandium by the thermite method.

**Alloys containing iron and zinc.** J. A. BULL. Norw. 34,130, Feb. 13, 1922. The Fe is added as an Fe-Zn alloy. This is produced specially at low temp. in large, continuously working, elec. furnaces. The furnace is heated from the sides only. Small contaminations of Pb in the Zn will sep. and can be drawn off at the bottom.

**Removing carbon from alloys.** G. STRIC. Norw. 34,544, Apr. 3, 1921. By addn. of Al, alone or in combination with Si and blowing air into the melted alloy the C can be burned off completely from alloys such as ferrochrome.

**Bronze alloy.** P. OSTENDORF. U. S. 1,457,288, May 29. An alloy which may be drawn into fine wires is formed of Cu at least 87, Sn 4.5-10, Ni 1-5 and Zn 1-5 parts.

**Copper and zinc alloy.** P. OSTENDORF. U. S. 1,457,289, May 29. An alloy which is resistant to chem. action is formed of Cu 40-55, Ni 3-15, Mn 1-3, Fe 1-2, Al 0.5-3 and Zn 25-40 parts.

**Stable heat-treated alloy steel.** P. A. E. ARMSTRONG. U. S. 1,456,088, May 22. An alloy steel, formed mainly of Fe together with Cr 3-10, Si 0.5-7 (Cr and Si together amounting to 5-13), and C over 0.05% but under  $1/16$  the total Cr and Si, is given a high surface stability by heating to about  $1010-1035^\circ$  and quenching.

**Treatment of mineral paste.** MASAO UCHINO, NAGAO TAKATSU and THE FURUKAWA KOGYO KABUSHIKI KAISHA. Japan. 40,433, Oct. 26, 1921. Mineral paste is a mixt. of hydroxides of many metals, mainly  $Cu(OH)_2$ , contg. about 90%  $H_2O$  and is obtained by neutralizing mineral water from refining plant, etc., in Cu mines, from which Cu is recovered by treating it with a mixt. of  $SO_2$  and air at  $70^\circ$ .  $Cu(OH)_2$  is converted into  $Cu(HSO_3)_2$ , then to  $Cu_2SO_3 \cdot CuSO_4$  and then to  $CuSO_4$ . The last acts on the acid sulfite of other metals, converting the other into sulfates, and  $Cu(HSO_3)_2$  is reformed. Repeating these reactions, Cu in the paste is changed into insol. salt, and the other metals into sol. sulfates. Cu in the soln. is recovered by a suitable method, such as electrolysis.

**Casting iron around copper or similar metals.** T. MIDGLEY, JR. U. S. 1,456,855, May 29. In casting ferrous metal around Cu or other metal which is a good heat conductor, *e. g.*, in casting Cu fins with ferrous engine cylinders, the good heat-conducting metal is preheated within the mold before the casting operation to establish a low heat differential between the 2 metals at the time of casting.

**Porous molds for casting metals.** V. LOUGHERD. U. S. 1,457,375, June 5. Porous molds adapted for casting dental inlays, brass or other metals are formed of a refractory porous material such as kieselguhr, kaolin and  $CaSO_4$  bonded with a small proportion of  $CaSO_4$  and admixed with sufficient Al or charcoal or other basic material to prevent reaction between the  $CaSO_4$  and the metal to be cast.

**Foundry core materials.** ECKERT, OPPELT, ET CIE. Brit. 189,781, Nov. 27, 1922. Foundry cores for steel castings, such as ingot molds, valve and pump casings, are made from Al nitride, or from substances contg. it, with addn. of a binder such as molasses, tar, etc.

**Foundry mold materials.** H. W. HUTTON. Brit. 189,360, Dec. 22, 1921. Foundry

sand is treated with an emulsion or aq. soln. of water-sol. drying oil, *e. g.*, linseed oil. Sulfonated fatty oil and sulfonated castor oil may be mixed with unsulfonated drying oil and resin acid may be added.

**Ingot molds.** J. R. ADAMS. U. S. 1,457,763, June 5.

**Arc-welding electrodes.** A. C. HYDE. Brit. 189,285, Sept. 27, 1921. A flux-coated electrode for elec.-arc welding is provided with an external wrapping of thin paper such as music-mending paper, linen, silk, cotton or other like fabric, or material which is consumable or volatilizable in the arc, so as to prevent the flux coating from becoming detached from the metal core. The adhesive used to attach the wrapping should also be free from matter which leaves a residum on the weld. The wrapping may be formed in strips which are wound on the electrode in the form of an open or closed helix. Cf. 150,372.

**Magnetic materials.** WESTERN ELECTRIC CO., LTD. Brit. 189,410, July 16, 1921. The properties of high permeability at low magnetizing forces and low hysteresis loss are developed in magnetic materials by heating the material to a temp. approximating to its magnetic transition temp. and cooling rapidly. The treatment may be applied to the Ni-Fe alloys described in 188,688 (*C. A.* 17, 1618) and the treated material may be used as a loading material for elec. signalling conductors as described in 189,075. In an example, an alloy contg. 78.5% Ni and 21.5% Fe in strip form is wound helically upon the cable to be loaded before treatment so as to avoid the necessity for straining the material after treatment, which would impair its improved qualities. The cable is then passed through an elec. furnace, which is maintained at a temp. of about 875°, at a rate which will allow the material to attain its crit. temp., stated to lie around 500–600°, and is then allowed to cool in air. The furnace consists of a copper-lined iron tube through which the material passes surrounded by resistance elements disposed between a fireclay muffle and a fire-brick wall. Other examples are given.

**Magnetic materials.** WESTERN ELECTRIC CO., LTD. Brit. 189,832, July 12, 1921. Addn. to 188,688 (*C. A.* 17, 1618). The resistivity of the magnetic material described in the principal patent is increased by the addn. of another element, such as Cr. The material may contain, *e. g.*, Ni 55, Fe 34, and Cr 11%. Cf. 189,075 and 189,410 (above).

## 10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

**The rotatory power of organic compounds.** H. RUPE. *J. chim. phys.* 20, 87–104 (1923); cf. *C. A.* 15, 501; 16, 3640.—A discussion of the relation between optical activity and constitution of org. compds. is given. Calens. for the dispersion curves included are based on Hagenbach's equation (*C. A.* 9, 1872) and a modification of Drude's equation. H. M. McLAUGHLIN

**Reducing action of Grignard reagents.** B. A. BUYLLA AND E. OLAY. *Anales soc. españ. fis. quim.* 20, 599–600 (1922).—Metal alkylates react with Grignard reagents giving hydrocarbons. *E. g.*, EtMgI in xylene, with Et<sub>2</sub>O or PhNMMe<sub>2</sub> as a catalyst, reacts with 1 mol. MeONa forming C<sub>2</sub>H<sub>6</sub> + CH<sub>4</sub> + MgO + NaI. Using EtMgI and AmONa, C<sub>2</sub>H<sub>6</sub> and an unidentified liquid hydrocarbon were obtained.

I. E. GILSON

**Method of industrial preparation of cacodylic acid and its salts.** CARLO INVERN. *Boll. chim. farm.* 62, 129–32 (1923).—Equal parts of As<sub>2</sub>O<sub>3</sub> and crude fused AcOK are intimately mixed and heated in an Fe retort. An aq. suspension of freshly pptd. Fe(OH)<sub>3</sub> is placed in the receiver and a current of air bubbled through it during the distn. The Fe salt of cacodylic acid is thus formed in 1 operation. The crude Fe salt is then treated with Ba(OH)<sub>2</sub>. The pptd. Fe(OH)<sub>3</sub> carries down practically all of the impurities, leaving a clear supernatant soln. of the Ba salt of cacodylic acid. This is treated with H<sub>2</sub>SO<sub>4</sub> and the filtrate evapd. to dryness. Recrystn. from 95% EtOH gives a pure product. The Na salt may be prepd. by neutralizing the acid with NaOH, and the Fe and quinine salts by double decompn. of the Ba salt with Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> and quinine sulfate, resp. The yield of cacodylic acid is 5 kg. from 60 kg. of the mixed As<sub>2</sub>O<sub>3</sub> and AcOK. A. W. DOX

**Catalytic synthesis of the acetals and their halogenation.** J. S. REICHERT, J. H. BAILEY AND J. A. NIKUWLAND. *J. Am. Chem. Soc.* 45, 1552–7 (1923); cf. *C. A.* 16, 235.—MeOH (500 cc.), 50 cc. concd. H<sub>2</sub>SO<sub>4</sub> and 5 g. HgSO<sub>4</sub> treated with C<sub>2</sub>H<sub>5</sub> until 66–75% of the alc. is used up (50 g. C<sub>2</sub>H<sub>5</sub> is absorbed in 3–4 hrs.) gives 25–30% MeCH(OMe)<sub>2</sub>. With EtOH the reaction is slower; with 10 g. HgSO<sub>4</sub> 50 g. C<sub>2</sub>H<sub>5</sub> is absorbed

in 6-8 hrs. and 30-5%  $\text{MeCH}(\text{OEt})_2$  is obtained. The higher alcs. (Pr, iso-Pr, Bu, iso-Bu, allyl, Am) give black viscous products from which can be recovered most of the original alc., and only small amts. of the acetals. Chlorination of  $\text{MeCH}(\text{OMe})_2$  yields  $\text{HCHO}$ ,  $\text{ClCH}_2\text{OMe}$ , small amts. of  $(\text{ClCH}_2)_2\text{O}$ ,  $\text{HCl}$ , trioxymethylene and  $\alpha, \beta$ -dichloroethyl Me ether, b. 127-38°, decompd. by  $\text{H}_2\text{SO}_4$  almost quant. into  $\text{ClCH}_2\text{CHO}$  and a little  $\text{Cl}_2\text{CHCHO}$ . The primary reaction is represented by the scheme  $\text{MeCH}(\text{OMe})_2 + \text{Cl}_2 \longrightarrow \text{ClCH}_2\text{CH}(\text{OMe})_2 + \text{HCl} \longrightarrow \text{ClCH}_2\text{CHClOMe} + \text{MeOH}$ ; the  $\text{MeOH}$  thus formed accounts for the formation of the other products obtained in the chlorination of  $\text{MeCH}(\text{OMe})_2$ . Complete bromination of  $\text{MeCH}(\text{OMe})_2$  (90 g.) with  $6 \times 85$  g. Br gives  $\text{HCHO}$ ,  $\text{BrCH}_2\text{OMe}$ ,  $(\text{BrCH}_2)_2\text{O}$  and  $\alpha, \beta, \beta, \beta$ -tetrabromoethyl Me ether, b. a little above 180° with violent decompn., hydrolyzed by  $\text{H}_2\text{SO}_4$  to  $\text{HBr}$ ,  $\text{MeHSO}_4$  and  $\text{CBr}_3\text{CHO} \cdot \text{H}_2\text{O}$ . Incomplete bromination (90 g.  $\text{MeCH}(\text{OMe})_2$  and 170 g. Br) gives  $\text{HCHO}$ ,  $\text{BrCH}_2\text{OMe}$  and  $\text{BrCH}_2\text{CHBrOMe}$ , b. 152-7° (slight decompn.). Complete chlorination of  $\text{MeCH}(\text{OEt})_2$  at 60-70° and subsequent treatment with concd.  $\text{H}_2\text{SO}_4$  gives  $\text{CCl}_3\text{CHO}$ ; the  $\text{MeCH}(\text{OEt})_2$  need not be isolated, as a 70% yield of  $\text{CCl}_3\text{CHO}$  can be obtained directly from the product of the action of  $\text{C}_2\text{H}_2$  on  $\text{EtOH}$ .

C. A. R.

**Decomposition of formamides [formyl derivatives] of aliphatic amines.** A. MAILHE. *Compt. rend.* 176, 1159-61 (1923); cf. C. A. 17, 2108.—Formyl derivs. of aliphatic amines are in many reactions similar to aromatic derivs., but with finely divided Ni there is a pronounced dehydrogenation effect upon the primary amines formed. When isoumyleformamide (I), prepd. by boiling iso-Bu formate with  $\text{C}_3\text{H}_7\text{NH}_2$  (II), viscous liquid b. 237°, is conducted in vapor form over  $\text{Al}_2\text{O}_3$  at 400-10°, it is completely decompd., forming II,  $\text{H}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$ , and  $\text{C}_4\text{H}_{11}\text{CN}$  by rearrangement from  $\text{C}_4\text{H}_{11}\text{NC}$  (cf. I. c.). When passed over Ni at 360°, the gaseous products are  $\text{CO}_2$  12,  $\text{CO}$  18,  $\text{H}_2$  18,  $\text{CH}_4$  47,  $\text{C}_4\text{H}_{10}$  5%; II is regenerated, and  $\text{C}_4\text{H}_9\text{CN}$  is formed; a part of II is broken down into  $\text{NH}_3$  and isoumylene which is further decompd.,  $\text{CH}_4$  being produced. Hydrogenation of I at 200-10° with Ni gives  $\text{AmNHMe}$ , and the  $\text{H}_2\text{O}$  formed reacts with additional I to give II,  $\text{CO}_2$ , and  $\text{H}_2$ .

A. R. ALBRIGHT

**Decomposition of trichloroacetic per-acid.** FR. FICHTER, ALBERT FRITSCH AND PAUL MÜLLER. *Helvetica Chim. Acta* 6, 502-6 (1923).—No indication of the existence of  $(\text{Cl}_3\text{CCO})_2$  was found in the reaction of  $\text{BaO}_2$  upon  $(\text{Cl}_3\text{CCO})_2\text{O}$ ; either it does not exist or it is very unstable. The reaction of  $\text{H}_2\text{O}_2$  and  $(\text{Cl}_3\text{CCO})_2\text{O}$  gives the per-acid, which is very unstable and decomp. quickly, yielding  $\text{COCl}_2$ ,  $\text{HCl}$ , and  $\text{CO}_2$ .  $\text{Cl}_3\text{COH}$  probably being an intermediate step.  $\text{Cl}_3\text{CCO}_2\text{CCl}_3$  decomp. under the same conditions to  $\text{Cl}_3\text{CCO}_2\text{H}$ ,  $\text{COCl}_2$  and  $\text{HCl}$ . The electrolysis of  $\text{Cl}_3\text{CCO}_2\text{K}(\text{Na})$  is explained by the primary formation at the anode of  $(\text{Cl}_3\text{CCO})_2$ , which decomp. into  $\text{Cl}_3\text{COH}$  and  $\text{CO}_2$ ; the alc. then reacts with the acid to give the ester.

C. J. WESS

**Aliphatic nitro alcohols. Degradation of nitrotrimethyleneglycol.** RUDOLF WILKENROD and MAX TRÉNEL. *Ber.* 56B, 611-20 (1923).—Schmidt and W. succeeded in adding 3 mols.  $\text{HCHO}$  to  $\text{MeNO}_2$  with formation of  $\text{O}_2\text{NC}(\text{CH}_2\text{OH})_3$  (I), and then in removing 1 of the  $\text{HCHO}$  mols. with  $\text{NaOEt}$  to form  $\text{O}_2\text{NCNa}(\text{CH}_2\text{OH})_2$  (II) (C. A. 13, 2361) but thus far it had not been found possible to prep.  $\text{O}_2\text{NCH}_2\text{CH}_2\text{OH}$  by removing a 2nd  $\text{HCHO}$  mol. This, however, can be effected if the Na in II is first replaced by Cl or Br (C. A. 16, 2475) and the resulting compd. is gently warmed with 2 mols.  $\text{NaOEt}$ :  $\text{O}_2\text{NCCl}(\text{CH}_2\text{OH})_2$  (III) +  $2\text{NaOEt} = \text{O}_2\text{NCCNaCH}_2\text{ONa}$  (IV) +  $2\text{EtOH} + \text{HCHO}$ . If the  $\text{O}_2\text{NCHClCH}_2\text{OH}$  (V) is set free with acids it immediately condenses again to III with the paraformaldehyde pptd. on the Na compd. and  $\text{MeNO}_2$  was accordingly used to remove the  $\text{HCHO}$ . In strongly alk. soln. the  $\text{HCHO}$  is removed as II, while in  $\text{Et}_2\text{O}$  suspension without addn. of alkali there is formed, not I, but the original III: IV +  $\text{HCHO} + \text{MeNO}_2 = \text{III} + \text{CH}_3\text{NaNO}_2$ , and as the latter itself adds  $\text{HCHO}$  II is also produced and on acidification the reaction mixt. yields V and  $\text{O}_2\text{NCH}(\text{CH}_2\text{OH})_2$  (VI), which are best sepd. by steam distn. The Br analog (VII) of V was prepd. in the same way but the  $\text{HCHO}$  was in this case removed by means of the more readily available  $\text{BrCH}_2\text{NO}_2$  instead of  $\text{MeNO}_2$ , thus giving twice as much  $\text{O}_2\text{NCHBrNaCH}_2\text{ONa}$  (VIII). The II was obtained in 99% yield by treating 61 g.  $\text{MeNO}_2$  and 60 g. paraformaldehyde in cold  $\text{MeOH}$  with 26 g. Na in  $\text{MeOH}$ . Na 2-chloro-2-nitroethanol (IV) is pptd. from  $\text{MeOH}$  by  $\text{Et}_2\text{O}$  with 2  $\text{MeOH}$ , is strongly alk., deflagrates vigorously in the flame, is decompd. by concd.  $\text{H}_2\text{SO}_4$  with evolution of flames and deposition of C, is very hygroscopic, quickly turns yellow to brown in the air, gives the Kononov and Hantzsch color reactions of nitroparaffin salts; in  $\text{H}_2\text{O}$ , it gives a strong red-brown color with  $\text{FeCl}_3$  and in suspension in  $\text{Et}_2\text{O}$  contg.  $\text{HCl}$  it assumes a sky-blue color. Treated in  $\text{Et}_2\text{O}$  suspension with 1 mol. crystd.  $(\text{CO}_2\text{H})_2$ , filtered, dried with  $\text{Na}_2\text{SO}_4$ , and fractionated *in vacuo*, the portion b.p. 98-9° being then distd. with steam.

salted out from the distillate with NaCl and extd. with  $\text{Et}_2\text{O}$ , it gives 50% of the free *2-chloro-2-nitro-ethanol* (V),  $b_{15}$  103°. In the prepn. of V, the IV need not be isolated; it can be obtained in 70–80% yield by treating 31 g. III in  $\text{H}_2\text{O}$  at room temp. with 60 g. of 50% KOH, then with 6 g.  $\text{MeNO}_2$ , neutralizing after 25 min. with AcOH in ice and extg. 1 hr. with  $\text{Et}_2\text{O}$ . Acetate, from V refluxed in  $\text{CHCl}_3$  (dried with  $\text{P}_2\text{O}_5$ ) with AcCl, thick oil of a penetrating, mustard-like odor,  $b_{15}$  101–2°; yield, 69%. *2,2-Dichloro-2-nitroethanol*, obtained in 40% yield by chlorinating in the dark in cold  $\text{Et}_2\text{O}$  suspension the mixt. of IV and II resulting from the treatment of III with NaOEt and  $\text{MeNO}_2$ , evap. and distg. with steam,  $b_{12}$  88–9°; acetate, obtained in 79% yield with AcCl in  $\text{CHCl}_3$ ,  $b_{15}$  105°. *Na 2-bromo-2-nitroethanol* (VIII) is obtained in 90% yield, the free ethanol (VII)  $b_{15}$  113° (yield, 41%); acetate,  $b_{20}$  110–1° (yield, 70%). *2,2-Dibromo-2-nitroethanol*, from VIII in cold  $\text{Et}_2\text{O}$  suspension with Br in  $\text{CHCl}_3$  (yield, 21%),  $b_{15}$  121°; acetate,  $b_{15}$  105–6°. *2-Nitroethanol*, from V, palladinized  $\text{BaSO}_4$  and H in aq.  $\text{C}_6\text{H}_5\text{N}$  (yield, 71%),  $b_{10}$  102°, can also be obtained in the same way from  $\text{O}_2\text{NCCl}_2\text{CH}_2\text{OH}$  or VII; with H and Pd– $\text{BaSO}_4$  in aq.  $(\text{CO}_2\text{H})_2$  it gives 88% of the oxalate,  $\text{C}_4\text{H}_8\text{O}_8\text{N}_2$ , m. 121–3° (decompn.), of *2-hydroxylaminoethanol*, thick alk. sirup vigorously reducing Fehling soln. in the cold. Attempts to remove the last HCHO mol. from  $\text{O}_2\text{NCCl}_2\text{CH}_2\text{OH}$  failed; with NaOMe at –10° it gives a salmon-colored ppt. which decomps. spontaneously into NaCl,  $\text{NaNO}_2$ , CO and N. C. A. R.

**Preparation of  $\beta$ -hydroxyethylamine and its salts.** SINITI KAWAI, *J. Chem. Soc. Japan* 44, 303–10(1923).—A few modifications are made on Gabriel's method of prepn. of  $\text{HOCH}_2\text{CH}_2\text{NH}_2$  from  $\text{C}_6\text{H}_5(\text{CO})_2\text{NK}$  (I) (*Ber.* 21, 569(1888)). In the prepn. of I, abs. alc. must be used as recommended by Meyer and Jacobson. With 90% alc., 200 g. of the imide gave 228 g. of *o*- $\text{KO}_2\text{CC}_6\text{H}_4\text{CONH}_2$ ; with 98% alc., 100 g. of the imide gave 101 g. of impure I; and with abs. alc., 100 g. gave 100 g. of I. The mixt. of the imide and alc. KOH need not be heated. Contrary to the literature, I is very sol. in cold  $\text{H}_2\text{O}$ . In the prepn. of  $\text{C}_6\text{H}_5(\text{CO})_2\text{NCH}_2\text{CH}_2\text{Br}$  more  $(\text{CH}_3\text{Br})_2$  than G. recommends should be used (1 : 4 instead of 1 : 3). The pure free base can be easily obtained from its salt by decomp. the salt with approx. the same amt. of KOH dissolved in the min. amt.  $\text{H}_2\text{O}$ , and distg. the mixt. under diminished pressure. The purity of the base was checked by the m. p. of the picrate (158–9.5°). S. T.

**The action of uranyl acetate on organic substances. II. Action on malic acid.** FRITZ KOPATSCHEK, *Anales assoc. quim. Argentina* 10, 318–24(1922).— $\text{UO}_2(\text{OAc})_2$  has no effect on the optical properties of inactive lactic acid. Added to a weak soln. of malic acid it causes an enormous increase (sometimes more than 80-fold) in the optical rotation due to the formation of an aceturanilic compd. similar to that produced with tartaric acid (cf. C. A. 17, 1214). This effect is diminished or nullified by the presence of almost any of the common inorg. salts. L. E. GILSON

**The origin of creatine. IV.  $\delta$ -Methylornithine and  $\delta$ -methylarginine.** K. THOMAS, J. KAPFFHAMMER AND B. FLASCHENTRÄGER, *Z. physiol. Chem.* 124, 75–102 (1922); cf. C. A. 13, 2024.—*dl*- $\alpha$ -Benzoylornithine, obtained by the malonic acid synthesis of Sørensen, was converted into  $\delta$ -toluenesulfonyl- $\alpha$ -benzoylornithine (I), m. 160–4° (with foaming). I was shaken with excess of alk.  $\text{Me}_2\text{SO}_4$ , heated 1 hr. at 100° and then acidified with AcOH;  $\delta$ -toluenesulfonylmethylamino- $\alpha$ -benzoylaminovaleric acid (II), sepd. as an oil which later crystd. and on recrystn. from AcOH m. 188–90°. The Bz radical of II is slowly eliminated by boiling with 20% HCl. After 30 hrs. 0.3 g. of *toluenesulfonyl-methylornithine-HCl* (III), m. 228°, was obtained from 4 g. of II; the free acid turns white at 230° and decomps. 245°.  $\delta$ -Methyl- $\alpha$ -benzoylornithine (IV), m. 215°, results from the reduction of III with  $\text{H}_2$  (d. 1.96) and  $\text{Pt}_2\text{I}$  in a bomb tube at 50–60°. From IV, *dl*-methylornithine dihydrochloride (V), m. 157°, was prepd. by 10 hrs. refluxing with 20% HCl. The chloroplatinate, m. 206° (decompn.). The anhydride, *N*-methyl- $\beta$ -(2)-aminopiperidone, is readily formed from V. The chloroplatinate, m. 210° and the picrate, 207°. V does not appear to be identical with the compd. isolated by Winterstein from lupine seeds which he regarded as isomeric with lysine. When IV is treated with  $\text{NH}_4\text{CN}$  in  $\text{H}_2\text{O}$   $\delta$ -methyl- $\alpha$ -benzoylarginine (VI), m. 260°, is formed in the course of several weeks. Hydrolysis of VI with 20% HCl gives *dl*-methylarginine dihydrochloride (VII), decomps. 215°; the *dinitrate*, m. 153°. The compd. formed from the nitrate of VII and  $\text{CuCO}_3$  ( $\text{C}_7\text{H}_{16}\text{O}_8\text{N}_4$ ) $\cdot\text{Cu}(\text{NO}_3)_2$  forms dark blue needles which lose  $\text{H}_2\text{O}$  of crystn. easily; it decomps. about 250°. VII behaves similarly to arginine toward alkaloidal precipitants. It is not pptd. by  $\text{Hg}^2+$  salts, or tannic, auric or chloroplatinic acids; it is pptd. by phosphotungstic acid, phosphomolybdic and  $\text{Hg}$  salts in alk. soln. A *monopicate* of VII decompd. without explosion at 207–9°. A *dipicrate* of VII was also prepd. Rabbit-liver arginase has no effect on methylarginine. This compd. when fed to rabbits was not excreted as creatinine. R. L. STEHLÉ



**Configuration of amino acids.** I. P. KARRER AND A. SCHLOSSER. *Helvetica Chim. Acta* 6, 411-8 (1923).—*Acetyl-asparagine*, m. 165°, is obtained in 60% yield from *l*-asparagine and  $\text{Ac}_2\text{O}$  in NaOH soln. Br in  $\text{Ba}(\text{OH})_2$  soln. gave *l*-glyoxalidone-5-carboxylic acid (I),  $\text{CH}_2\text{NH.CO.NH.CHCO}_2\text{H}$ , decomp. 184°,  $[\alpha]_D^{15}$  —16.5°; rhombic

crystals,  $a : b : c = 0.8601 : 1 : 0.6356$ ,  $m(110)$ ,  $q(011)$ ,  $b(010)$ ;  $m : m', 81^\circ 25'$ ;  $m : q, 69^\circ 21'$ ;  $q : q', 64^\circ 51'$ . *Ag* salt, needles. *Me* ester, m. 78°, *Me l*-acetyl-asparaginate, sirup,  $[\alpha]_D^{19}$  —41.14°. *Amide*, decomp. 230°. The action of 20% HCl upon I gives *d*- $\text{H}_2\text{NCH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H.HCl}$ , which has been transformed into *d*-isoserine (*Biochem. Z.* 1, 380 (1906)), and *d*-glyceric acid. Since earlier results have shown that  $\text{HNO}_2$  transforms *l*-asparagine into *l*-isoserine, methods are now known for forming either *l*- or *d*-glyceric acid.

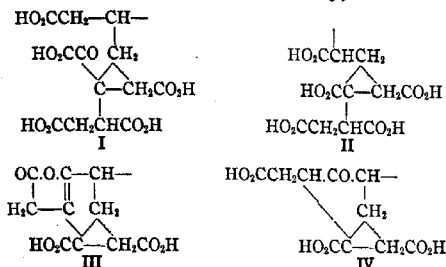
**Synthesis of an acid of the digitoxonic acid group.** GÉZA ZEMPLÉN. *Ber.* 56B, 686-9 (1923).— $\text{MeCH:CHCH}(\text{OH})\text{CH}_2\text{CO}_2\text{Et}$ ,  $b_{70-5}$  86°, is obtained in 160-70 g. yield from 240 g.  $\text{MeCH:CHCHO}$  and 550 g.  $\text{BrCH}_2\text{CO}_2\text{Et}$  in a freezing mixt. treated in the course of 18 hrs. with 450 g. granulated Zn (previously immersed a few sec. in dil. HCl, washed and dried over  $\text{P}_2\text{O}_5$ ) and allowed to stand 12 hrs. longer in the freezing mixt. and 2 days at room temp.; 15 g. of this allowed to stand 6 weeks with 14.7 g.  $\text{BzO}_2\text{H}$  in  $\text{CHCl}_3$ , freed from the  $\text{CHCl}_3$  *in vacuo*, taken up in alc. and shaken a few hrs. on 4 consecutive days with aq.  $\text{Ba}(\text{OH})_2$  gives 6.7 g. of a sirup contg. 81.5% of a *digitoxonic* ( $\beta, \gamma, \delta$ -trihydroxyacproic) acid, isolated as the *Ba* salt,  $(\text{C}_8\text{H}_{11}\text{O}_6)_2\text{Ba}$ . The sirup (4 g.), dehydrated by repeated evapn. with abs. alc., gives with  $\text{PhNHNH}_2$  in alc. 1.1 g. of the *phenylhydrazide* of the acid, m. 159°.

**Polysaccharides.** XIX. **Heats of combustion of carbohydrates.** P. KARRER AND W. FIORONI. *Helvetica Chim. Acta* 6, 396-401 (1923); cf. *C. A.* 17, 988.—The following heats of combustion of carbohydrates are based upon the value 6324 cal. for 1 g.  $\text{BzOH}$ . Glucose 3743 cal.; galactose, 3724; saccharose, 3945; maltose, 3949; cellobiose, 3944; lactose, 3948; stachyose, 4065; arabinose, 3731; xylose, 3735; rhamnose, 4379; levoglucosan, 4181; glucose 1,2-anhydride, (calcd. about 4288); diamylose, 4285;  $\alpha$ -tetramylose, 4196;  $\beta$ -hexaamylose, 4166;  $\alpha$ -octaamylose, 4620; inulin, 4190; xylan, 4242; glucose pentaacetate, 4424.5; galactose pentaacetate, 4422.5; saccharose octaacetate, 4472; maltose octaacetate, 4468; cellobiose octaacetate, 4471; lactose octaacetate, 4466; rhamnose triacetate, 4654.8; triacetyllevoglucosan, 4530; glucose 1,2-anhydride 3,5,6-triacetate, 4594.8; starch acetate, 4499; cellulose acetate, 4496; inulin acetate, 4522; xylan acetate, 4548. XX. **Polymerized carbohydrates.** P. KARRER. *Ibid.* 402-9.—4.2 g. sol. starch (Zulkowsky) treated with  $\text{AcBr}$  at 0° for 14 hrs., gave 1.8 g. pure heptaacetylmaltose after treatment with  $\text{Ag}_2\text{CO}_3$ ; the same amt. was obtained from maltose. Only slight amts. of glucose were recovered from the mother liquors. When the crude acetobromomaltose (from either starch or maltose) is dried in  $\text{Et}_2\text{O}$  soln., then taken up in MeOH and shaken with  $\text{Ag}_2\text{CO}_3$  for 2 hrs., 6-14%  $\beta$ -methylheptaacetylmaltoside are obtained. Some of Irvine's recent criticisms are answered.

**Extraction of  $\beta$ -ethylgalactoside in presence of large amounts of reducing sugars.** J. CHARPENTIER. *J. pharm. chim.* 27, 368-71 (1923).—Arabinose (I), being sol. in  $\text{AcOEt}$  renders impossible the sepn. of  $\beta$ -ethylgalactoside (II) by means of  $\text{AcOEt}$  from the reaction mass formed in the biochem. action of emulsin on a 70%  $\text{EtOH}$  soln. of a mixt. of I and galactose, the products of hydrolysis of gum arabic. Quant. sepn. is effected by converting the unchanged aldoses into the next higher homologous acids (Bougault and Perrier, *C. A.* 14, 2624). To the mixt. add an equal vol. (300 cc.) of 1.171%  $\text{HCN}$  and 15 drops  $\text{NH}_4\text{OH}$ ; when after 24 hrs. the optical deviation becomes stationary, add drop by drop Pb subacetate, filter, remove Pb by  $\text{H}_2\text{S}$ , again filter, evap. to dryness and ext. II with  $\text{AcOEt}$ . The II shows  $[\alpha]_D$  —4.40°, m. 159-60°.

**Bile acids.** XIV. **Cilicnic acid, ciloidanic acid and biloidanic acid.** H. WIELAND AND OTTO SCHLICHTING. *Z. physiol. Chem.* 123, 213-36 (1922); cf. *C. A.* 16, 3638.—Ciloidanic acid (I) with  $\text{H}_2\text{SO}_4$  at 60° loses 1  $\text{CO}$ , 1  $\text{CO}_2$  and 1  $\text{H}_2\text{O}$  and is converted into a *ketotetracarboxylic acid*  $\text{C}_{22}\text{H}_{20}\text{O}_8$ , m. 238°,  $[\alpha]_D^{16}$  73.5°. The product with  $\text{HNO}_3$  (d. 1.4) at 100° gives biloidanic acid (II) which by heating is converted by loss of 2  $\text{CO}_2$  and 2  $\text{H}_2\text{O}$  into *pyrroloiloidanic acid*,  $\text{C}_{20}\text{H}_{18}\text{O}_5$  (III), m. 193-5° (decompn.). Alkali causes one of the rings of III to open by taking up 1  $\text{H}_2\text{O}$ . The resulting compd. forms a hydrate  $\text{C}_{20}\text{H}_{20}\text{O}_6 \cdot \text{H}_2\text{O}$  (IV), which foams at 185-8°, then solidifies and finally m. 233°. To account for the origin of II from ciloidanic acid W. and S. have modified their view of the formulas of cholic, bilianic, cilicnic and ciloidanic acids. They believe the O of ring 3 in cholic acid to be in position 13 (left C atom in same formula) instead of in

12 (middle C). To II they now give the formula  $C_{22}H_{42}O_{12}$  and find it identical with norsolanolic acid whose structural formula is accordingly revised.



**XV. Pseudocholoidanic acid.** H. WIELAND. *Ibid* 237-45; cf. *C. A.* 14, 1812.—Pseudocholoidanic acid (I) is  $C_{22}H_{42}O_{12}$  instead of  $C_{22}H_{42}O_{11}$ . It is isomeric with cilianic acid and m.  $304^\circ$  instead of  $301^\circ$  as given previously. Unusual stability characterizes it. Fuming  $\text{HNO}_3$  at  $100^\circ$ , fused alkali, and Zn and HCl have no effect; neutral  $\text{KMnO}_4$  at  $100^\circ$  leaves a large portion unchanged, and concd.  $\text{H}_2\text{SO}_4$  acts but slowly. *Di-Me pseudo choloidanate* (II) crystallizes from MeOH in long needles, m.  $268^\circ$ . Heating I *in vacuo* at  $290^\circ$  for 1 hr. gives  $C_{22}H_{38}O_8$ , m.  $246^\circ$ . II heated for 1 hr. at  $270-80^\circ$  and then distd. gives  $C_{22}H_{38}O_8$ , m.  $192^\circ$ .

R. L. STEHLE

**Ergosterol of yeast.** A. WINDAUS AND W. GROSSKOPF. *Z. physiol. Chem.* 124, 8-14(1922).—The same sterol, ergosterol, was obtained from yeast as Tanret had obtained previously from ergot. It was identified by prep. the acetate. The acetate on hydrogenation when recrystd. from  $\text{Et}_2\text{O-MeOH}$  gives needles, m.  $103^\circ$ . The free alc., ergostanol,  $C_{27}H_{46}O$ , m.  $129^\circ$ . The hydrocarbon, ergostane, prepd. by intermediate formation of the chloride (not isolated), m.  $72-3^\circ$ ,  $[\alpha]_D^{25}$  24.5. By the oxidation of ergostanol the ketone, ergostanone, m.  $56-7^\circ$  was obtained.

R. L. STEHLE

**Preparation of  $\beta$ -3,4-dinitrodimethylaniline.** P. S. VARMA. *J. Proc. Asiatic Soc. Bengal, Proc. 8th Indian Sci. Cong.* 17, cxxiv(1922).— $\beta$ -3,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{NMe}_2$ , prepd. by Swann (cf. *C. A.* 14, 1297), can be prepd. in high yield by treating the  $\text{H}_2\text{SO}_4$  addn. product of  $\text{PhNMe}_2$  with nitrous gases below  $0^\circ$ . Any rise in temp. gives very poor yields.

C. C. DAVIS

**Picryl sulfide; the binary system trinitroanisole-picryl sulfide.** CHAUMEIL AND V. THOMAS. *Compt. rend.* 176, 1323-5(1923).—A study of the binary mixt. ( $\text{NO}_2$ ) $_3\text{-C}_6\text{H}_5\text{OMe}$  and picryl sulfide (I) has been made. The eutectic mixt. m.  $62.5^\circ$  contains 13% I. The results of the study are expressed graphically.

H. E. W.

**Dinitrosoresorcinol.** W. R. ORNDORFF AND M. L. NICHOLS. *J. Am. Chem. Soc.* 45, 1536-9(1923).—The dinitrosoresorcinol, obtained in 94.6% yield by a modification of Fittz's method, seps. from 50% alc. in very thin rhombic plates,  $a : b : c = 0.9(?) : 1 : 0.613$ , which after 40 days *in vacuo* over  $\text{H}_2\text{SO}_4$  lose 0.815%  $\text{H}_2\text{O}$  (contrary to F.'s statement, the  $\text{H}_2\text{O}$  of crystn. cannot be detd. by heating at  $105^\circ$  in  $\text{CO}_2$ ) and then have the compn.  $\text{C}_6\text{H}_2\text{O}_5(\text{NOH})_2 \cdot \text{H}_2\text{O}$  and decomp.  $162-3^\circ$ .

C. A. R.

**Molecular transpositions accompanying the dehydration of primary  $\alpha,\alpha$ -disubstituted phenylethyl alcohols.** PAULINE RAMART AND J. BLONDEAU. *Compt. rend.* 176, 1320-3(1923).— $\text{PhMeEtCCH}_2\text{OH}$  was dehydrated catalytically over infusorial earth in the vapor state in a tube at  $400^\circ$ . The colorless hydrocarbons obtained were distd. and were identified through the products of oxidation by  $\text{CrO}_3$  in  $\text{HOAc}$ .  $\text{MeCOEt}$ ,  $\text{AcPh}$  and  $\text{EtCOPh}$  were characterized by means of the resp. semicarbazones.  $\text{BzOH}$  was also present. The hydrocarbons were therefore 2-phenyl-2-pentene, 1-phenyl-2-methyl-1-butene and 3-phenyl-3-pentene.  $\text{PhCEt}_2\text{CH}_2\text{OH}$  was treated similarly and a study of the ketones showed that there were formed 2-phenyl-2-ethyl-1-butene and probably 3-phenyl-3-hexene.  $\text{EtPhBzCCH}_2\text{OH}$  gave on dehydration  $\text{BzEtC:CHPh}$ . Primary  $\alpha,\alpha$ -phenylethanol react according to the scheme  $\text{PhR'R''CCH}_2\text{OH} \rightarrow \text{R'R''C:CHPh}$  and  $\text{PhR'R''CCH}_2\text{OH} \rightarrow \text{PhR'R''C:CHR'}$  and  $\text{PhR'R''C:CHR'}$ .

H. E. W.

**Reduction products of benzalpinacolin.** G. A. HILL, C. S. SPEAR AND J. S. LA-CHOWICZ. *J. Am. Chem. Soc.* 45, 1557-62(1923).—Pinacolin, b.  $103-8^\circ$ , obtained in 71.8% yield by distg. pinacol hydrate with 3 parts of 6 N  $\text{H}_2\text{SO}_4$  gave with  $\text{BzH}$

and NaOH in EtOH-H<sub>2</sub>O 92.6% benzalpinacolin (I), *b*<sub>10</sub> 144-5°, *m*. 43°. I on treatment with various reducing agents yielded 3 of the 4 products which, as a typical  $\alpha,\beta$ -unsatd. ketone, it might be expected to yield, *viz.*,  $\omega$ -benzylpinacolin, PhCH<sub>2</sub>CH<sub>2</sub>COCMe<sub>2</sub> (II),  $\beta$ -phenylethyl-*tert*-butylcarbinol (III) and 2,2,9,9-tetramethyl-5,6-diphenyldecane-3,8-dione (IV). All 3 were obtained, in various amts., with most of the reducing agents employed [(Al-Hg, Mg-Hg (72% IV), Na-Hg, Na-EtOH (73% II, 8.6% III), Na in moist Et<sub>2</sub>O (59% II, 18% IV), Zn-AcOH (39% IV)]; catalytic reduction with Pd gave only II (85%). II is a fragrant, nearly colorless, highly refractive liquid, *b*. 247°, *b*<sub>10</sub>-2 153°, slowly attacked by KMnO<sub>4</sub>; *oxime*, *m*. 95°. II was also obtained in 30% yield by treating NaNH<sub>2</sub> with pinacolin in Et<sub>2</sub>O and then with PhCH<sub>2</sub>Cl. III, *m*. 142°; attempts to synthesize this compd. or to prep. an Ac or Bz deriv. have thus far been unsuccessful. IV, *m*. 208.5°; it can also be obtained in 7.9% yield by satg. I in Et<sub>2</sub>O with HCl, evapp. *in vacuo* at room temp. and treating the resulting somewhat unstable PhCHClCH<sub>2</sub>COCMe<sub>2</sub> in Et<sub>2</sub>O with Na. C. A. R.

**Oxidative cleavage of hydrazones and derivatives of hydroxyhydrazine.** MAX BERGMANN, REINHOLD ULPTS AND CHARLOTTE WITTE. *Ber.* 56B, 679-82(1923).—In seeking for some means of regenerating reducing substances of the sugar group from their hydrazones, which cannot always be effected by the usual methods, B., U. and W. studied the action of BzO<sub>2</sub>H on anils and hydrazones. PhCH:NNHPh (10 g.) with 7.5 g. BzO<sub>2</sub>H in Et<sub>2</sub>O gives 6.5-7.0 g. benzaldehyde phenylhydrazone *oxide*, O.CHPH.NNHPh

(I), faintly yellowish, *m*. 201° (decompn.), unchanged and undissolved by boiling 5 N H<sub>2</sub>SO<sub>4</sub> or concd. HCl, quickly dissolved, with decompn., by boiling AcOH and by Ac<sub>2</sub>O, gives a deep blue-green color in concd. H<sub>2</sub>SO<sub>4</sub> with a few drops aq. FeCl<sub>3</sub> and then a little H<sub>2</sub>O (if the H<sub>2</sub>O is not subsequently added, the color does not appear). With AcOH at 150°, 15 g. I yields 2 g. BzI, 1.1 g. AcOPh (mixed with a little free PhOH) and 1.05 g. BzNNHPh. With an equal wt. of PhNNH<sub>2</sub> on the H<sub>2</sub>O bath, I reacts violently in a few min., 10 g. giving 1 g. PhNBzNHBz and 2 g. PhCN. From I with 1.5 parts PhNH<sub>2</sub> at 130° is obtained 10% of *p*-PhC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>. PhNMe<sub>2</sub> at 150° gives BzNNH<sub>2</sub>. *Furfural phenylhydrazone oxide* (2.3 g. from 6.5 g. of the hydrazone and 5 g. BzO<sub>2</sub>H), faintly yellow, is much less stable than I, decompg. rapidly and completely in hot C<sub>6</sub>H<sub>5</sub>N. PhCH:NPh (1.5 g.) with 2 mols. BzO<sub>2</sub>H yields 0.8 g. PhNO and 1-1.5 g. BzH. From PhC:NNHPh and 3 mols. BzO<sub>2</sub>H is obtained 55% PhCO. C. A. R.

**Preparation of synthetic vanillin by the ozone process.** B. C. WOOD. *Chem. Met. Eng.* 28, 806-8(1923); cf. C. A. 17, 1633.—The oxidation of isoeugenol to vanillin (I) by O<sub>3</sub> is so rapid at ordinary temp. that it must be retarded to prevent the formation of resins. Ozonized air is drawn through isoeugenol contained in towers with NaHSO<sub>3</sub> soln., which combines with the I as fast as it is formed and prevents further action by the O<sub>3</sub>. The bisulfite liquor is sepd. after 8 hrs. and the I freed by 30% H<sub>2</sub>SO<sub>4</sub> at 80°. The I is extd. with C<sub>6</sub>H<sub>6</sub> and recrystd. 3 times from H<sub>2</sub>O. Preliminary slow cooling gives needle crystals. Fe must be avoided in the final crystn. The app. and process are described in detail. E. H. VOLWILER

**Synthesis of ephedrine.** E. FOURNEAU AND J. PUYAL. *Anales soc. espñ. fis. quim.* 20, 394-9(1922).—PhCH:CHMe (I) was prepd. in 40% yield by the catalytic dehydration of PhCH(OH)Et, by means of a hot tube filled with granules of a mixt. of clay and infusorial earth. With Br water I gives the corresponding bromohydrin, *b*<sub>2</sub> 145-55°, in fair yield. This by heating in a sealed tube for 3 hrs. at 120° with an excess of NH<sub>2</sub>Me gave PhCH(OH)CHMeNHMe. After recrystn. the base *m*. 60° and the HCl salt at 180°. By acetylation of the latter compd. is obtained acetylpseudoephedrine, *m*. 176°, which when heated 5 hrs. with a large excess of HCl gives pseudoephedrine-HCl, *m*. 175°, from which the free base, *m*. 117°, is obtained with Na<sub>2</sub>CO<sub>3</sub>. L. E. GILSON

**Synthesis of coumar- and coniferaldehydes.** H. PAULY AND K. WÄSCHER. *Ber.* 56B, 603-10(1923); cf. Klason, C. A. 17, 1230.—The MeOCH<sub>2</sub> ethers have been found to be an excellent means of masking phenolic HO groups which diminish the reactivity of the CHO group in vanillin and related aldehydes; these ethers are quite stable towards alkalis but exceedingly sensitive towards acids so that after the CHO group has undergone the desired reaction (*e. g.*, condensation with AcH), the phenolic HO group can easily be set free again and this method affords a practicable means of prep. the phenol-acroleins. Thus, from 18 g. *o*-MeOCH<sub>2</sub>OC<sub>6</sub>H<sub>4</sub>CHO (I), *b*<sub>2</sub> 128-9° (obtained in 33% yield from MeOCH<sub>2</sub>Cl and *o*-NaOC<sub>6</sub>H<sub>4</sub>CHO), condensed 8 hrs. in aq. alc. at 60° with AcH and KOH are obtained 8 g. unchanged I, 10 g. resin and 37% methoxymethyl-*o*-coumaraldehyde, light yellow, *m*. 55°, *b*<sub>2</sub> 158-9°, which, boiled 5 min. with 50% AcOH contg. 0.3% H<sub>2</sub>SO<sub>4</sub>, gives HCHO and *o*-HOC<sub>6</sub>H<sub>4</sub>CH:CHCHO, light yellow, *m*. 133°.

Similarly *p*-MeOCH<sub>2</sub>OC<sub>6</sub>H<sub>4</sub>CHO, *b*<sub>1</sub> 132–4° (obtained in 45% yield from MeOCH<sub>2</sub>Cl and *p*-NaOC<sub>6</sub>H<sub>4</sub>CHO) gives after 10 hrs. 26% of *methoxymethyl-p-coumaraldehyde*, viscous oil, *b*<sub>1</sub> 158–60°, which, boiled 45 min. with AcOH-H<sub>2</sub>SO<sub>4</sub>, yields *p-coumaraldehyde* (*p-hydroxycinnamaldehyde*), pale yellow, *m*. 134°, whose *semicarbazone*, *m*. 224°. *Methoxymethyl-o-vanillin*, 3,2-MeO(MeOCH<sub>2</sub>O)C<sub>6</sub>H<sub>3</sub>CHO, obtained in 11% yield from *o*-vanillin, NaOEt and MeOCH<sub>2</sub>Cl in PhMe, *m*. 56°, *b*<sub>2</sub> 128–30°, gives in aq. alc. with AcH after 10 hrs. at 65–8° 49.5% *methoxymethyl-o-coniferaldehyde*, light yellow, *m*. 91°, hydrolyzed by boiling AcOH-H<sub>2</sub>SO<sub>4</sub> in 20 min. to *o-coniferaldehyde* (*o-hydroxy-methoxycinnamaldehyde*), pale yellow, *m*. 131°, gives a dirty red ppt. with FeCl<sub>3</sub> in aq. alc.; *semicarbazone*, *m*. 198°. *Methoxymethyl-p-vanillin* (yield, 59%), *m*. 40°, *b*<sub>1</sub> 145–9°, gives with AcH in aq. alc. at 70° after 17 hrs. 26% *methoxymethyl-p-coniferaldehyde*, pale yellow, *b*<sub>1</sub> 165–7°, *m*. 77–8°, hydrolyzed by boiling AcOH-H<sub>2</sub>SO<sub>4</sub> in 1 hr. to *p-coniferaldehyde*, pale yellow, *m*. 82.5°, forms a NaHSO<sub>3</sub> compd. insol. in excess of NaHSO<sub>3</sub> and with PhNH<sub>2</sub> a red-yellow compd.; *semicarbazone*, pale yellow, *m*. 218° to a red liquid.

C. A. R.

The distillation products of  $\alpha$ -truxillic acid. Obtainment of a fourth truxillic acid. HANS STOBBER AND FRITZ ZSCHOCK. *Ber.* 56B, 676–8(1923).—Distn. of four 30-g. portions of  $\alpha$ -truxillic acid gave at 90–190° 1.6 g. of a colorless aq. liquid, at 190–290° 26.6 g. of (chiefly) *trans*-cinnamic acid, at 290–320° 50.7 g. of a mixt. of stilbene, a compd. *m*. 192–4°,  $\gamma$ -truxillic anhydride (*m*. 189–90°) and a new  $\eta$ -truxillic anhydride (I), above 320°, with much decompn., 3.4 g. of a yellow-red liquid contg. H<sub>2</sub>O and tarry products, and 18.1 g. residue. I, *m*. 287°, depresses the *m*. p. of truxone (*m*. 294°) 30°, does not give the blue KOH melt typical of truxone, mol. wt. in boiling C<sub>6</sub>H<sub>6</sub> 271–8, does not decolorize KMnO<sub>4</sub> in Na<sub>2</sub>CO<sub>3</sub> at 0°, is only slightly sol. in NaOH, gives with piperidine what is probably  $\eta$ -truxillpiperididic acid, *m*. 240°, neutral to litmus. Digested a long time with Ba(OH)<sub>2</sub> I gives  $\eta$ -truxillic acid, *m*. 260° (278–80° if previously heated a long time at 150–60°), markedly depresses the *m*. p. of the  $\alpha$ -acid. Liebermann's "distyryl" (*Ber.* 22, 124(1889)) is the above mixt. of 4 compds. contained in the 290–320° fraction. Distn. of 50 g. *trans*-cinnamic acid gave: (1) Up to 280°, chief fraction, contg. 30 g. cinnamic acid and 3 g. of a neutral portion sepd. by further fractionation into styrene and stilbene; (2) from 280° to 310°, 1 g. of a resinous mass; (3) 8 g. of carbonized residue.

C. A. R.

Polymerization of allyl cinnamalacetate. F. F. BLUCKE. *J. Am. Chem. Soc.* 45, 1562–6(1923).—Allyl cinnamalacetate (I), obtained in 45–50% yield from allyl alc., PhCH:CHCH:CHCO<sub>2</sub>H (II) and H<sub>2</sub>SO<sub>4</sub> at 90–5°, is light yellow, highly refractive, *b*<sub>10</sub> 210°, is readily sapon. by alc. KOH, instantly decolorizes Br in CS<sub>2</sub> and KMnO<sub>4</sub> in H<sub>2</sub>O; *hexabromide*, *m*. 126°, seps. from alc. in solvated crystals, *m*. 111–2°. Heated in small evacuated bulbs for 7 days at 210°, I gradually becomes more and more viscous and finally changes into a light yellow, almost solid mass which, dissolved in Me<sub>2</sub>CO and poured into much cold alc., gives 25% of an amorphous, amber-like polymer of I; this in boiling Me<sub>2</sub>CO with 5 equivs. alc. KOH (calcd. on the basis of the monomol. I) gives a slightly yellow amorphous polymer of II; heated with anhydrous Ba(OH)<sub>2</sub> this acid gives a mixt. of liquid compds., undoubtedly hydrocarbons, which decolorizes Br and KMnO<sub>4</sub> and therefore contains at least 1 unsatd. constituent. Com. grades of allyl alc. and chloride undergo spontaneous polymerization on long standing.

C. A. R.

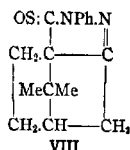
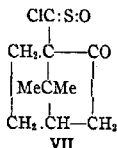
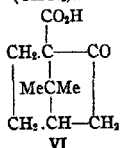
Higher terpene compounds. VIII. Constitution of nerolidol (peruvitol). L. RUZICKA. *Helvetica Chim. Acta* 6, 483–92(1923); cf. C. A. 17, 2281.—The constitution of nerolidol (I) is of special interest because, excepting farnesol (II) (Kerschbaum, C. A. 7, 2753), it is the only known perfume of the sesquiterpene series. 5 kg. Peru balsam gave, upon sapon. with KOH and fractionation of the resulting oil, 94 g. I, *b*<sub>10</sub> 96–98°, *d*<sub>4</sub><sup>20</sup> 0.8778, *n*<sub>D</sub><sup>20</sup> 1.4786, [ $\alpha$ ]<sub>D</sub> 15.5°. When I is heated with Ac<sub>2</sub>O at 120–40° in a CO atm. for several hrs. there results a *sesquiterpene*, C<sub>15</sub>H<sub>24</sub>, *b*<sub>12</sub> 128–30°, *d*<sub>4</sub><sup>19</sup> 0.8428, *n*<sub>D</sub><sup>19</sup> 1.4937,  $\alpha_D$  –3.6°; this probably contains considerable farnesene, Me<sub>2</sub>C:CHCH<sub>2</sub>CH<sub>2</sub>CMc:CHCH<sub>2</sub>CH<sub>2</sub>CMc:CHCH<sub>2</sub>CH<sub>2</sub>CMc:CH<sub>2</sub>; heating with 90% HCO<sub>2</sub>H gives a monocyclic *sesquiterpene*, C<sub>15</sub>H<sub>24</sub>, *b*<sub>12</sub> 130–2°, *d*<sub>4</sub><sup>20</sup> 0.8724, *n*<sub>D</sub><sup>20</sup> 1.4944,  $\alpha_D$  –1.6°, besides a polymerization product. The 2nd fraction contains unchanged I, while the 3rd fraction contains II, characterized by transformation into farnesal. Oxidation of I with K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and H<sub>2</sub>SO<sub>4</sub> at 60–80° also gave farnesal. The formula for I is therefore Me<sub>2</sub>C:CHCH<sub>2</sub>CH<sub>2</sub>CMc:CHCH<sub>2</sub>CH<sub>2</sub>CMc(OH)CH:CH<sub>2</sub>. IX. The total synthesis of *d*-nerolidol and farnesol. *Ibid* 492–502.—Sapon. of 60 g. musk-seed oil with MeONa gave 19 g. pure farnesol (I). 7.7 g. I, heated with 10 g. K<sub>2</sub>SO<sub>4</sub> at 170° and 12 mm. gave 4 g. of a *sesquiterpene* (largely farnesene), *b*<sub>12</sub> 128–30°, *d*<sub>4</sub><sup>18</sup> 0.8385, *n*<sub>D</sub><sup>18</sup> 1.4965, which, heated with 90% HCO<sub>2</sub>H, gave

a monocyclic sesquiterpene, identical with that described above. Geranyl chloride (II) may be prepd. in small amts. by the use of  $\text{PCl}_5$  but in the prepn. of large amts.  $\text{PCl}_5$  should be used. II and  $\text{AcCHNaCO}_2\text{Et}$  gave  $\alpha,\beta$ -dihydropseudoionone (Kerschbaum), which, condensed with  $\text{NaNH}_2$  and  $\text{C}_6\text{H}_6$ , gave *dehydro-dl-nerolidol* (*homogeranylethynylmethylcarbinol*),  $\text{Me}_3\text{C}:\text{CHCH}_2\text{CH}_2\text{CMe}:\text{CHCH}_2\text{CH}_2\text{CMe}(\text{OH})\text{C}:\text{CH}$ ,  $b_{\text{p}}$ , 100–2°,  $b_{\text{H}}$  146–7°,  $d_4^{19}$  0.8908,  $n_D^{19}$  1.4789. Reduction with moist  $\text{Et}_2\text{O}$  and Na gave *dl-nerolidol*,  $b_{\text{p}}$ , 98–100°,  $b_{\text{H}}$  145–6°,  $d_4^{18}$  0.8788,  $n_D^{18}$  1.4801. No cryst. derivs. could be prepd. Action of  $\text{Ac}_2\text{O}$  gave I, identified as above. This may exist in 4 stereoisomeric forms, and it is possible that the varying densities of the products isolated from various provinces indicate the existence of different stereoisomeric forms or mixts. of these.

C. J. WESS

Transformation of *d*- and *l*-camphorsulfonyl chloride into 10-*d*- and -*l*-chlorosulf-oxide-camphor: constitution of ketopinic acid and of Reychler's camphorsulfonic acid. E. WEDEKIND, D. SCHENK AND R. STÜSSER. *Ber.* 56B, 633–49(1923).—The chloride (I) of Reychler's *d*-camphorsulfonic acid (II) with  $\text{NEt}_3$  at once splits off HCl, yielding  $\text{NEt}_3\text{HCl}$ , but the resulting "sulfene,"  $\text{C}_{10}\text{H}_{16}\text{O}:\text{SO}_2$ , has such a tendency to take up  $\text{H}_2\text{O}$  that it abstracts the elements of it from the excess of I with formation of II, so that 0.5 of the original I is recovered as the  $\text{NEt}_3$  salt of II and the other 0.5 as a new compd., *d*-chlorosulf-oxide-camphor,  $\text{C}_{10}\text{H}_{16}\text{O}_2\text{SCl}$  (III). The Cl in III is quite firmly held, not being removed by  $\text{Ag}_2\text{O}$  or boiling  $\text{AgNO}_3$ ; III has no acid properties; the usual methods for removing a  $\text{SO}_3\text{H}$  group from aromatic compds. (even several hrs. treatment with highly superheated steam or with concd. HCl at 80° in sealed tubes) failed to remove the S from III; gentle warming with  $\text{PhNHNH}_2$ , however, removes the otherwise resistant Cl as  $\text{PhNHNH}_2\text{HCl}$ , while the rest of the mol. reacts normally as a C:O compd. with the excess of  $\text{PhNHNH}_2$ ; boiling dil.  $\text{HNO}_3$  quant. removes the S as  $\text{H}_2\text{SO}_4$  and yields three S-free compds., 2 of which still contain Cl while the 3rd is Cl-free. Only the 1st and 3rd of these were homogeneous; one (formed in the larger amt.) had the compn. of a *dinitrochlorocamphor* (IV) and could not be reduced to a dinitrocamphor with  $\text{Ca-Zn}$  in boiling alc., even boiling alc. KOH only partially eliminating the Cl. The 3rd product was *d-ketopinic acid* (V), which can also be obtained from III with alk.  $\text{KMnO}_4$ . The constitution of V was left open by its discoverers (Gilles and Renwick), but as it is formed by oxidation of pinene-HCl and on further oxidation gives camphoylic (carboxyapocamphoric) acid it can have only the structure VI, and III must have the structure VII, formed by elimination of  $\text{H}_2\text{O}$  from the  $\text{CH}_2\text{SO}_3\text{Cl}$  group in I and migration of the Cl from the S to the C atom. In IV both  $\text{NO}_2$  groups and the Cl atom are attached to the same 10-C atom, for on heating with  $\text{H}_2\text{O}$  or milk of lime in sealed tubes it gives V and  $\text{SnCl}_2\text{HCl}$  reduce it to the nitrile of V; since, in the latter reaction,  $\text{NH}_3$  and  $\text{NH}_4\text{OH}$  are formed, a diaminochlorocamphor,  $\text{RC}(\text{NH}_2)_2\text{Cl}$ , and an amino-oxime,  $\text{RC}(\text{NH}_2)\text{NOH}$ , are probably both intermediate products. Although the Cl in III is stable towards cold alkalis, KCl is eliminated on heating (immediately with spontaneous evolution of heat with alc. KOH);  $\text{NH}_3$  also reacts with III in alc. or  $\text{Et}_2\text{O}$ ;  $\text{BaCO}_3$  in boiling alc. yields an oil of ester-like odor; an alk. Pb soln. added to III in KOH-MeOH gives a red-brown ppt. which darkens and blackens on heating and evolves  $\text{H}_2\text{S}$  on acidification; on treatment with steam or long standing with  $\text{NH}_3$  in MeOH III gives cryst. S; after long boiling of III in  $\text{H}_2\text{O}$  the soln. contains  $\text{H}_2\text{SO}_4$  and HCl; those oxidizing agents which generally convert sulfoxides into sulfones ( $\text{KMnO}_4$  in AcOH) split off the SO group of III as  $\text{H}_2\text{SO}_4$  with formation of V, while 20%  $\text{H}_2\text{O}_2$  in AcOH (used for the prepn. of sulfoxides from sulfides and thiols) does not attack III. In the action of  $\text{PhNHNH}_2$  (see above), the normal phenylhydrazone is undoubtedly first formed but by loss of HCl is immediately changed into a peculiar pyrazolone deriv. in which the O of the C:O group is replaced by SO and which is provisionally designated as *norcamphorylsulfoxide-N-phenylpyrazolone* (VIII). The above results also establish that in II the  $\text{SO}_3\text{H}$  group is on C atom 10 and not on 6, and that the various " $\beta$ -camphor" compds. derived from it are likewise 10-derivs. III, obtained in 5 g. yield from 25 g. I and 11 g.  $\text{NEt}_3$ , is light yellow, m. 85°, mol. wt. in freezing PhOH 215–31,  $[\alpha]_D^{18}$  58.28° ( $\text{C}_6\text{H}_6$ ), 136.2° ( $\text{CHCl}_3$ ). *l*-Antipode, prepd. in the same way from *l*-camphorsulfonyl chloride,  $[\alpha]_D^{18}$  –58.04° ( $\text{C}_6\text{H}_6$ ), –136.2° ( $\text{CHCl}_3$ ), *dl*-compd., m. 103.5°. III is also obtained in 25 g. yield from 100 g. I and 35 g.  $\text{C}_6\text{H}_5\text{N}$ . VIII (0.4 g. from 1 g. III), flocculent yellow ppt. from a mixt. of AcOH with very dil. alc., changes about 80° to a clear red-brown resin, decomps. 155°, sol. in concd.  $\text{H}_2\text{SO}_4$  with green color deepening on warming. V (2 g. from 5 g. III), m. 234°,  $[\alpha]_D^{18}$  28.02° ( $\text{C}_6\text{H}_6$ ); *l*-antipode,  $[\alpha]_D^{18}$  –27.67° ( $\text{C}_6\text{H}_6$ ). IV (6 g. from 20 g. III), m. 150.5° (decompn.), mol. wt. in freezing  $\text{C}_6\text{H}_6$  258.5,  $[\alpha]_D^{18}$  52.56° ( $\text{C}_6\text{H}_6$ ), 55.47°

(CHCl<sub>3</sub>); *l*-antipode,  $[\alpha]_D^{18} -52.13^\circ$  (C<sub>6</sub>H<sub>6</sub>),  $-55.40^\circ$  (CHCl<sub>3</sub>). The (active) phenylhydrazones of *d*- and *l*-V m.  $150.5^\circ$ , that of *dl*-V m.  $126.5^\circ$  (Gilles and Renwick give  $146^\circ$ ). Nitrile of V (1.5 g. from 5 g. IV), m.  $197-8^\circ$ ,  $[\alpha]_D^{18} 26.45^\circ$  (CHCl<sub>3</sub>); *l*-antipode,  $[\alpha]_D^{18} -26.10^\circ$  (CHCl<sub>3</sub>).



C. A. R.

**The benzil rearrangement. II, III.** ARTHUR LACHMAN. *J. Am. Chem. Soc.* 45, 1509-14, 1522-9(1923); cf. *C. A.* 16, 1579.—Bz<sub>2</sub> in dry Et<sub>2</sub>O with 1 or more mols. NaOEt forms almost instantly a voluminous cryst. *addn. compd.*, PhC(ONa)(OEt)Bz, stable when protected from moisture but instantly and quant. decompd. by H<sub>2</sub>O into Bz<sub>2</sub>, NaOH and EtOH. Under its mother liquor it decomp. very slowly (85% of the original Bz<sub>2</sub> can be recovered after 5 days) but if it is formed in a mixt. of Et<sub>2</sub>O with sufficient alc. to prevent its pptn. or in abs. alc. the soln. completely decomp. in 3-5 days at room temp. into BzH and BzOEt, with a small amt. of BzONa and only traces of Ph<sub>2</sub>C(OH)CO<sub>2</sub>H (I). When the solvent contains 5% of H<sub>2</sub>O, 13% of the original Bz<sub>2</sub> is recovered as I; with a little more than 20% of H<sub>2</sub>O the yield of I jumps to 80%. Temp. changes up to the b. p. of the solvent do not affect the relative yields of I and BzOH. These results show that HO groups are a necessary factor in the metakiny of Bz<sub>2</sub> (PhCOCOPh + H<sub>2</sub>O) → PhC(OH)<sub>2</sub>COPh → PhC(OH) + CO(OH)Ph → Ph<sub>2</sub>C(OH)CO<sub>2</sub>H while NaO and EtO groups are incapable of shifting; the theory previously advanced that the rearrangement of Bz<sub>2</sub> is due to a mobile HO group is the only one consistent with the exptl. facts. A repetition of Jourdan's reaction between Bz<sub>2</sub> and KCN in alc., whereby BzH and BzOEt are formed (*Ber.* 16, 659(1883)) showed that it is accompanied by considerable evolution of heat and is complete in 2-10 min., depending on the concn. The BzOEt formed is always entirely free of I. *Addn.* of H<sub>2</sub>O does not result in the formation of I, not even a fraction of a mg. of I being formed from 10 g. Bz<sub>2</sub> with KCN in 100 cc. of 25% alc.; in spite of the low alc. concn. over 90% of the BzOH appears as BzOEt, indicating that BzCN is the primary product of the reaction (Bz<sub>2</sub> + KCN + H<sub>2</sub>O → BzCN + BzH + KOH), as it was shown that BzCN acts almost instantly on weakly alk. alc. and also that it is actually formed from anhyd. HCN and Bz<sub>2</sub>. Heated to 90-5° with anhydrous HCN, Bz<sub>2</sub> forms almost quant. [PhC(OH)CN]<sub>2</sub> (II), which, contrary to Zinin's statement (*Ann.* 34, 189(1840)), is quickly and quant. decompd. by boiling H<sub>2</sub>O into Bz<sub>2</sub> and HCN and with HgO in boiling alc. gives Bz<sub>2</sub> and Hg(CN)<sub>2</sub>, not BzOEt and metallic Hg. At 120-40° in a sealed tube II gives chiefly *mandelonitrile benzoate*, m. 61°, b<sub>2</sub> 173°, b<sub>10</sub> 200°, evolves gas 280-5°, is but slightly affected by long boiling with moderately dil. HCl, loses all its N as NH<sub>3</sub> with hot 85% H<sub>2</sub>SO<sub>4</sub>, slowly loses NH<sub>3</sub> with boiling 6 *N* NaOH, with formation of BzH and BzOH, at once gives BzOEt and NaCN with NaOEt; it is also obtained in 80% yield from equimol. amts. of BzCN and PhCH(OH)CN at 120°. Bz<sub>2</sub> is unchanged by long heating at 100° with 85% H<sub>2</sub>SO<sub>4</sub> or at 175° with 25% H<sub>2</sub>SO<sub>4</sub>. Although Bz<sub>2</sub> is not known to form a monocyanohydrin, PhCOCPh(OH)CN (III), the comparative indifference of II makes it probable that III is an intermediate product in the Jourdan reaction. The non-formation of I in this reaction may be explained on the reasonable assumption that the III is ionized: PhCOCOPh + KCN → PhCOCPh(CN)O<sup>-</sup> + K<sup>+</sup> (cf. Lapworth, *J. Chem. Soc.* 89, 945(1906)), the resulting ion contg. no HO group, but it is also possible that some other factor, in addn. to the presence of HO groups in the mol., is necessary for the formation of I. **IV. Benzoin.** *Ibid* 1529-35.—Anhyd. HCN does not attack PhCH(OH)Bz (IV) even at 125-30° but alc. HCN gives BzOEt and PhCH<sub>2</sub>OH; under the same conditions neither BzH nor PhCH(OH)CN yields BzOEt. With NaOEt, IV forms an *addn. product* similar to that of Bz<sub>2</sub> which, however, has not been obtained pure, as it carries considerable adhering or adsorbed mother substance; it decomp., at least in part, into PhCH<sub>2</sub>OH and BzOEt. Although no "benzoin rearrangement" of IV into Ph<sub>2</sub>CHCO<sub>2</sub>H can be effected with alkalis, it can be brought about by acids (H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>) at high temps. Variation in the concn. of the acid between 1 and 6 *M* has no great effect on the yield; time and temp. are more important factors. The reaction is complicated by various side processes; at the necessary temp.

(200–50°) the heat reactions already observed by others take place;  $H_2SO_4$  accelerates the oxidation of IV to Bz, being itself reduced to  $H_2S$ ; these reactions are faster than the rearrangement and thus serve to withdraw IV from the amt. available for the rearrangement; finally,  $Ph_2CHCO_2H$  is not very stable under the given conditions, decomp. into  $CO_2$  and  $CH_2Ph_2$ . The best yield of  $Ph_2CHCO_2H$  thus far obtained has been about 9% (with 6  $M$   $H_3PO_4$  heated 66 hrs. at 230°). The significance of the above facts and their application to the general theory of rearrangements are briefly discussed.

C. A. R.

**Nitration of 1,1'-naphthyl.** C. S. SCHORFFLE. *J. Am. Chem. Soc.* **45**, 1566–71 (1923).—Repetition of the work of Julius (*Ber.* **19**, 2550(1886)) has shown that distn. of  $\beta$ -binaphthyl (I) with Zn dust gives  $\beta$ -binaphthylene oxide (II), m. 156° (J., 154°), identical with the product obtained by dehydrating I with  $ZnCl_2$  at 270°, and not 1,1'-binaphthyl (III), and the nitration products he describes are therefore derivs. of II instead of III. With picric acid in  $C_6H_6$ , II gives the deep red picrate, m. 159°. In AcOH at room temp. 5 g. II with 5 g.  $HNO_3$  (d. 1.3) yields 5.7 g. of the light yellow  $NO_2$  deriv., m. 187°, and with 40 g.  $HNO_3$  at 60° 6.5 g. of the orange-yellow di- $NO_2$  deriv., m. 306–7° (J. gives 188° and 280° for his supposed corresponding derivs. of III). III, obtained in 50% yield from  $1-C_{10}H_7Br$ , Cu powder and a little I at 280–5° and identical with a product prepd. from  $1-C_{10}H_7MgBr$  and anhyd.  $CuCl_2$ , m. 157°; with 0.5 part of  $HNO_3$  (d. 1.42) in AcOH at 90–5° it gives 85% of *q*-nitro-*r*,*r'*-binaphthyl, light yellow, m. 104°, while with 2 parts  $HNO_3$  is obtained 60% of the *4,4'*-dinitro deriv. (IV), light yellow, m. 246°; the mother liquors yield small amts. of 2 other isomeric light yellow dinitro compds., m. 228° and 144°. IV was also obtained in 1.5 g. yield from 5 g.  $1,4-C_{10}H_6I_2NO_2$ ,  $C_{10}H_8$  and Cu powder at 220–30°.

C. A. R.

**Ring closures in  $\gamma$ -arylbutyric acids to derivatives of 1-ketotetrahydronaphthalene.** F. KROLLPFEIFFER AND W. SCHÄFER. *Ber.* **56B**, 620–32(1923).—The  $\gamma$ -arylbutyric acids were prepd. by letting the corresponding  $\gamma$ -keto acids and 10 parts amalgamated Zn stand at least 2–3 hrs., with frequent shaking, under just enough 30% HCl to cover the Zn and then boiling vigorously 6–10 hrs. Although attempts to convert these acids into 1-keto-1,2,3,4-tetrahydronaphthalene (I) derivs. by direct elimination of  $H_2O$  between the side chain and the nucleus by means of concd.  $H_2SO_4$  were not successful in all cases, it may be said in general that their tendency to undergo such a condensation is quite pronounced.  $PhCH_2CH_2CH_2CO_2H$  (obtained in 80% yield), heated 3 hrs. on the  $II_2O$  bath with 5 parts concd.  $H_2SO_4$  gives 50% I,  $b_{12}$  127°. From 15 g.  $p$ - $MeC_6H_4(CH_2)_3CO_2H$  (obtained in 80% yield) is obtained 9 g. of the *7*-*Me* deriv. of I, m. 32.5–3.5°; semicarbazone, m. 224–5°. The ketone (5 g.), reduced by Clemmensen's method, gives 2 g. 2-methyl-5,6,7,8-tetrahydronaphthalene, b. 224–6°, and with Br in  $CS_2$  yields the *7*-methyl-2-bromo deriv. of I, m. 80.5°, which produces severe burns on the skin and 9 g. of which, boiled 1 hr. with 50 g.  $PhNEt_3$ , regenerates about 1 g. of the Br-free ketone and yields 2 g. *7*-methyl-1-naphthol,  $b_{12}$  153–9°, m. 109°, couples with diazotized  $p$ - $O_2NC_6H_4NH_2$  in alk. soln. to a blue dye changing to red with acids.  $p$ - $EtC_6H_4COCH_2CH_2CO_2H$ , obtained in 70 g. yield from 60 g. succinic anhydride and 100 g.  $PhEt$  with  $AlCl_3$  in  $C_6H_6$ , m. 98–9°.  $\gamma$ -*p*-Ethylphenylbutyric acid, m. 69–70°, gives 50–5% of the *7*-*Et* deriv. of I,  $b_{12}$  152–3°, slowly becomes brown-red in the air; semicarbazone, m. 223–5°. Reduction of the ketone gives 2-ethyl-5,6,7,8-tetrahydronaphthalene; b. 245–6°. 2,4- $Me_2C_6H_3COCH_2CH_2CO_2H$ , m. 111–2°, the  $Me_2C_6H_3(CH_2)_3CO_2H$ , m. 71°, gives 10–5% of the *5,7*-*Me\_2* deriv. of I, m. 49–50°, the small yield being due to sulfonation of the xylylbutyric acid. The ketone, which  $b_{12}$  180–2°, is obtained in 40% yield from  $Me_2C_6H_3COCl$  heated *in vacuo* at 150° until the evolution of HCl ceases; semicarbazone, m. 234–5°. *ar*-1,3-Dimethyltetralin (2.5 g. from 5 g. of the ketone with amalgamated Zn and HCl), b. 250–2°.  $\beta$ -2-Tetroylpropionic acid (60 g. from 50 g. succinic anhydride and 100 g. tetralin with  $AlCl_3$  in  $C_6H_6$ ), m. 121–2°.  $\beta$ -2-Tetralylbutyric acid, m. 49–50°, gives 75% 1-ketotetrahydroanthracene ("octhracenone," Schroeter, *C. A.* **15**, 525),  $b_{12}$  202°, m. 46–7°; semicarbazone, m. 252–3°; 2-Br deriv., m. 110°, produces severe burns on the skin and with  $PhNEt_3$  in part regenerates the Br-free ketone and in part forms 5,6,7,8-tetrahydro-1-anthrol, m. 124°, becomes brown in the air, couples with diazotized  $p$ - $O_2NC_6H_4NH_2$  to a violet dye which is not fast to acids.  $\beta$ - $\alpha$ -Naphthylsuccinic acid, from  $CH_2(CO_2Et)_2$  refluxed in  $C_6H_6$  with Na and then with  $\alpha$ - $C_{10}H_7COCH_2Br$ , decomps. 158°, with loss of  $CO_2$ , 10 g. giving 5 g. of  $\beta$ - $\alpha$ -naphthoylpropionic acid, m. 131–2°.  $\gamma$ -*p*-Methoxyphenylbutyric acid, m. 59–60°, gives with  $H_2SO_4$  only an easily sol.  $SO_3H$  acid, but vacuum distn. of its chloride gives the *7*-*MeO* deriv. of I, m. 60–1°; semicarbazone, m. 222–4°.  $\beta$ -Benzoyl- $\alpha$ -methylpropionic acid (50 g. from 60 g. pyrotartaric anhydride and  $AlCl_3$  in  $C_6H_6$ ), m. 139–40°.  $PhCH_2CH_2CHMeCO_2H$ ,  $b_{12}$  174°; anilide, m. 140°. 2-Me deriv. of I (2 g. from 5 g. of the

above acid),  $b_{11}$  132°, slowly turns brown in the air; *semicarbazone*, formed exceedingly slowly (3 days), m. 199–201°. Below are given, resp.,  $t^\circ$ ,  $d_4^{20}$  and  $n_D$  for  $\alpha$ ,  $\beta$  and  $\gamma$  at  $t^\circ$  for the derivs. of I: *ac*-2-Me, 20.9°, 1.0600, 1.54669, 1.55154, 1.56542, 1.57764; 7-Me, 35.0°, 1.0569, 1.55168, 1.55674, 1.57160, 1.58479; 7-Et, 17.2°, 1.0556, 1.55478, 1.55988, 1.57454, 1.58732; 5,7-Me<sub>2</sub>, 15.5°, 1.0654, 1.55086, 1.56496, 1.57971, 1.59284. Derivs. of tetrahydronaphthalene: *ar*-2-Me, 15.1°, 0.9541, 1.53316, 1.53719, 1.54907, 1.55897; *ar*-2-Et, 17.6°, 0.9499, 1.53072, 1.53474, 1.54627, 1.55594; *ar*-1,3-Me<sub>2</sub>, 21.0°, 0.9589, 1.53683, 1.54094, 1.55287.

C. A. R.

**$\beta$ -Methylantraquinone derivatives. II. Synthesis of chrysophanic acid.** R. EDER and C. WIDMER. *Helvetica Chim. Acta* 6, 419–24 (1923); cf. *C. A.* 16, 1583.—The earlier reported methods for the prepn. of chrysophanic acid were unsatisfactory because of the poor yields of intermediate products. If  $\alpha$ -O<sub>2</sub>NC<sub>6</sub>H<sub>3</sub>(CO<sub>2</sub>H)<sub>2</sub> is condensed with *m*-C<sub>6</sub>H<sub>4</sub>Me<sub>2</sub> by means of AlCl<sub>3</sub> and a large excess of *m*-C<sub>6</sub>H<sub>4</sub>Me<sub>2</sub>, a 40% yield of benzoylnitrobenzoic acid is obtained, while if  $\alpha$ -O<sub>2</sub>NC<sub>6</sub>H<sub>3</sub>(CO)<sub>2</sub>O is used, the yield is 96%. The condensation of  $\alpha$ -AcHNCC<sub>6</sub>H<sub>3</sub>(CO)<sub>2</sub>O and *m*-C<sub>6</sub>H<sub>4</sub>Me<sub>2</sub> by AlCl<sub>3</sub> gives 2,4'-HO(Me)-C<sub>6</sub>H<sub>3</sub>COC<sub>6</sub>H<sub>3</sub>(NH<sub>2</sub>)CO<sub>2</sub>H (I), while the use of  $\alpha$ -HOCC<sub>6</sub>H<sub>3</sub>(CO)<sub>2</sub>O gives the corresponding 2'-HO deriv. The yields are poor, but the corresponding yields starting from the NO<sub>2</sub> deriv. are also poor. 1-Hydroxy-8-amino-3-methylantraquinone, by the action of concd. H<sub>2</sub>SO<sub>4</sub> at 150° upon I, red needles with bronze luster, m. 245–6°. Diazoitized and treated with H<sub>2</sub>SO<sub>4</sub> at 120°, this gives chrysophanic acid. 1-Hydroxy-5-amino-3-methylantraquinone, bronze-colored, m. 248–9°.

C. J. WEST

**Natural and synthetic humic acids.** J. MARCUSSEN. *Mitt. Materialprüfungsamt.* 40, 245–9 (1923); cf. *C. A.* 17, 1645.—A general discussion of the furan nature and acid properties of humic acid.

C. J. WEST

**Hydroxypyrrrole derivatives. III.** ERICH BENARY and WILHELM LAU. *Ber.* 56B, 591–7 (1923); cf. *C. A.* 17, 1230.—The present incomplete results are published in view of the appearance of the papers of Küster and Maag (*C. A.* 17, 1231) and of Fischer and Herrmann (*C. A.* 17, 280). Diacetonitrile (I) in cold C<sub>6</sub>H<sub>5</sub>N-H<sub>2</sub>O with ClCH<sub>2</sub>COCl gives about 70% of *C*-chloroacetyl diacetonitrile, MeC(NH<sub>2</sub>):C(CN)COCH<sub>2</sub>Cl, m. 155°, which with KSH in alc. yields  $\beta'$ -thiobis-[ $\alpha$ -acetyldiacetonitrile] S[CH<sub>2</sub>COC(CN):C(NH<sub>2</sub>)Me]<sub>2</sub>, m. 178–9°, insol. in alkalis but on long contact with *N* NaOH it slowly dissolves and HCl ppts.  $\beta'$ -thiobis-[ $\alpha$ -acetylacetoacetonitrile], S[CH<sub>2</sub>COC(CN):C(OH)Me]<sub>2</sub>, m. 130°, which gives a red ppt. with FeCl<sub>3</sub> in alc., dissolves easily in dil Na<sub>2</sub>CO<sub>3</sub> and reacts acid to litmus. *C*-Bromoacetyl diacetonitrile, m. 148–8°. Thus far it has not been possible to obtain pure a hydroxypyrrrole from the above halogenoacetyl derivs. of I although the pine-splinter reaction gave indications of pyrrole formation with elimination of the halogen acid. *C*-Chloroacetyl-*N*-phenyldiacetonitrile, obtained in 60% yield from MeC(NHPh):CHCN, m. 103–4°, gives with KSH in cold MeOH  $\beta'$ -thiobis-[ $\alpha$ -acetyl-*N*-phenyldiacetonitrile], m. 170–2°, and with KOH in MeOH yields almost quant. 1-phenyl-3-hydroxy-5-methylpyrrole-4-carboxylonitrile (II), m. 167°, which is sol. in dil. NaOH, gives a red pine-splinter reaction and a red color with alc. FeCl<sub>3</sub>, evolves some NH<sub>3</sub> with boiling 5% NaOH but remains for the most part unchanged, gives with an equal amt. of NaNO<sub>2</sub> and HCl in warm alc. 1-phenyl-2-isonitroso-3-keto-5-methylpyrrolone-4-carboxylonitrile (III), orange-yellow, turns dark brown 160°, decomp. 178°, easily sol. in dil. Na<sub>2</sub>CO<sub>3</sub>; from II or III with 2 parts NaNO<sub>2</sub> in AcOH is obtained the orange 2-nitroimino analog of III, easily deflagrates on heating, decomp. 225°, easily sol. in dil. Na<sub>2</sub>CO<sub>3</sub>, converted by 5% NaOH after 24 hrs. into 3-carbamido-4-phenyliminoacetoxalic nitroamide, MeC(NPh)C(CONH<sub>2</sub>):C(OH)CONHNO<sub>2</sub>, light yellow, changes 237°, decomp. 240–1°, easily sol. in Na<sub>2</sub>CO<sub>3</sub>, gives a red color with alc. FeCl<sub>3</sub>, titrates rather sharply as a monobasic acid with phenolphthalein, gives with PhNHNH<sub>2</sub> in 50% AcOH on the H<sub>2</sub>O bath 3-acetyl-3-carbamidoindolenine-2-carboxynitroamide anil, C<sub>6</sub>H<sub>4</sub>N:C(CONHNO<sub>2</sub>)C(CONH<sub>2</sub>)CMe:NPh, brown-yellow, darkens

205°, decomp. 225°, gives a brown color with FeCl<sub>3</sub> in alc., dissolves in concd. H<sub>2</sub>SO<sub>4</sub> with dark red color. *C*-Chloroacetylbenzoacetodinitrile (IV), PhC(NH<sub>2</sub>):C(CN)COCH<sub>2</sub>Cl, m. 116°.  $\beta'$ -Thiobis-[ $\alpha$ -acetylbenzoacetodinitrile], m. 195–8°, insol. in and stable towards cold NaOH. With NH<sub>3</sub> in MeOH in a closed vessel IV after 24 hrs. gives anhydro-2,3'-bis-[3-keto-5-phenylpyrrolone-4-carboxylonitrile] hydrate(?), NH.CPh.C(CN).CO.C.C(CN).CPh.NH.H<sub>2</sub>O, pptd. from dil. NaOH by HCl as a

red-violet powder, decomp. about 250°, mol. wt. in freezing PhNH<sub>3</sub> 375–8, sol. in dil. NaOH and aq. NH<sub>4</sub>OH with intense dark red color.

C. A. R.

**4(5)-Nitroimidazole-5(4)-carboxylic acid.** A. WINDAUS and W. LANGENBECK. *Ber.* 56B, 683–6 (1923).—While the Me group in 4(5)-methylimidazole does not react



with aldehydes, the introduction of a  $\text{NO}_2$  group makes it reactive; 4(5)-nitro-5(4)-methylimidazole with  $\text{BzH}$  and a little piperidine at  $150-60^\circ$  gives 60% 4(5)-nitro-5(4)-styrylimidazole (I), golden yellow, decomp.  $220^\circ$ , sol. in alkalis with orange-red color. The analogous compd.,  $\text{C}_{17}\text{H}_{11}\text{O}_2\text{N}_3$ , from  $p\text{-MeOC}_6\text{H}_4\text{CHO}$  is orange-yellow and m.  $296^\circ$  (decompn.). In cold  $\text{NaOH}$  with  $\text{KMnO}_4$ , 10 g. I gives  $\text{BzOH}$  and 7.2 g. 5(4)-nitroimidazole-4(5)-carboxylic acid, m. above  $300^\circ$  (decompn.), loses  $\text{CO}_2$  with formation of nitroimidazole after 1 hr. at  $150^\circ$ ; *Me ester*, m.  $212-3^\circ$ , gives, like the free acid, a deep yellow soln. with alkalis; *amide*, m.  $291^\circ$ , easily sol. in  $\text{NH}_4\text{OH}$  and dil.  $\text{NaOH}$ . The ester with  $\text{Pd}$  black in alc. takes up 3 mols.  $\text{H}$ ; the resulting colorless soln. of the *Me* 4(5)-aminoimidazole-4(5)-carboxylate becomes blue in the air and with concd. aq. picric acid yields a yellow *picrate*,  $\text{C}_{11}\text{H}_{10}\text{O}_5\text{N}_4$ , m.  $235^\circ$  (decompn.); *HCl salt*,  $\text{C}_8\text{H}_8\text{O}_2\text{N}_3\text{Cl}$ , m. about  $210^\circ$  (decompn.). The  $\text{NO}_2$  amide is similarly reduced to the  $\text{NH}_2$  amide, whose *picrate* decomp. about  $240^\circ$ ; *HCl salt*. C. A. R.

Synthesis of imidazoleglycine, the lower homolog of histidine. C. P. STEWART. *Biochem. J.* 17, 130-3(1923).—Iminazoly-4(or 5)-methyl alc. was obtained from citric acid by Pyman's method (C. A. 5, 3047) and oxidized to iminazoly-4(or 5)-formaldehyde (Pyman, C. A. 10, 1631), which in turn was converted to the amino nitrile by the joint action of  $\text{KCN}$  and  $\text{NH}_4\text{Cl}$ . The amino nitrile was converted to the corresponding amino acid by hydrolysis.

3,6-Diamino-9-benzyl-10-methyldihydroacridine. P. KARRER. *Helvetica Chim. Acta* 6, 409-11(1923).—The action of  $\text{PhCH}_2\text{MgBr}$  upon 3,6-diaminoacridine methochloride- $\text{HCl}$  gives 3,6-diamino-9-benzyl-10-methyldihydroacridine,  $\text{C}_{24}\text{H}_{24}\text{N}_2$ ; it is only slightly changed in the air. Dihydrochloride, oxidizes in the air and turns red.

C. J. WEST

Use of rhodanine in organic syntheses. II. Amino acids and keto acids. CH. GRÄNACHER, M. GERÖ, A. OFNER, A. KLOPPENSTEIN and E. SCHLATTER. *Helvetica Chim. Acta* 6, 458-67(1923); cf. C. A. 16, 3898.—The condensation of rhodanine (I) with aldehydes and  $\alpha$ -diketones usually proceeds smoothly, giving good yields of easily crystallizable compds. The condensation products can be readily decomp. by  $\text{NaOH}$ , giving sulfohydrylic acids, which, in the aliphatic series, are usually oils. *Ethylidene-rhodanine*, brownish yellow, m.  $143^\circ$ , results from I and paraldehyde in  $\text{AcOH}$ . *Crotonal deriv.*, brownish yellow, m.  $189^\circ$ . *Isovalerylidene deriv.*, pale brownish yellow, m.  $83^\circ$ . *Phenylethylidene deriv.*, yellow, m.  $217^\circ$ . *Rhodanalglyoxylic acid*, dark brownish red, decomp.  $225^\circ$ . *Et ester*, yellow. *K salt*, brownish yellow. *p-Methoxysulfohydrylicinnamic acid* (II), by decomp. anisalrhodanine with  $\text{NaOH}$ , golden yellow, m.  $178^\circ$ , in 90-96% yields. With  $\text{NH}_4\text{OH}$  this gives *p-methoxyphenylpyrrocaramic acid oxime* (III), m.  $159^\circ$ .  $\text{MeOC}_6\text{H}_4\text{CH}_2\text{COCO}_2\text{H}$  results by the action of concd.  $\text{NH}_4\text{OH}$  upon II or better by the action of  $\text{HCHO}$  and  $\text{HCl}$  upon III, while the reduction of III by  $\text{Na-Hg}$  gives an 80-90% yield of  $\text{MeOC}_6\text{H}_4\text{CH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$ . *Methylenedioxyphenylpyrrocaramic acid oxime*, yellowish, m.  $156-8^\circ$ . Reduction by  $\text{Na-Hg}$  gives *methylenedioxyphenylalanine*, browns at  $210^\circ$ , m.  $250-5^\circ$ . *p-Isopropylsulfohydrylicinnamic acid*, yellow amorphous powder. *p-Isopropylphenylpyrrocaramic acid oxime*, m.  $170^\circ$ . The free acid m.  $140^\circ$ . *p-Isopropylphenylalanine*, m.  $255^\circ$ . III. Derivatives of oxindole. CH. GRÄNACHER and A. MAHAL. *Ibid* 467-82.—Condensation of isatin and rhodanine (I) quant. gives  $\beta$ -rhodanaloxindole (II),  $\text{C}_8\text{H}_4\text{NH.CO.C.C.CO.NH.CS.S}$ ,  
 $\text{[C}_8\text{H}_4\text{NH.CO.C.C.CO.NH.CS.S]}$

(termed by Andreasch, C. A. 12, 276, rhodanine-2-indolindigo), brownish black, sol. in concd.  $\text{H}_2\text{SO}_4$  with a yellow color and in  $\text{C}_6\text{H}_5\text{N}$  with a red or red-violet color, forming a brilliant red addn. product,  $(\text{C}_{11}\text{H}_6\text{O}_2\text{N}_2\text{S}_2)\cdot\text{C}_8\text{H}_4\text{N}$ , decompd. by cold  $\text{H}_2\text{O}$  or warm  $\text{EtOH}$ . II, regenerated from the addn. compd., warmed with 10%  $\text{NaOH}$ , yields oxindole- $\beta$ -sulfohydrylic acid (III),  $\text{C}_8\text{H}_4\text{NH.CO.C.C}(\text{SH})\text{CO}_2\text{H}$ , deep orange to ver-

million amorphous powder. Rhodanine-2-indolindigo (Felix, C. A. 4, 3196) does not give a  $\text{C}_8\text{H}_4\text{N}$  addn. compd., and yields indoxyl- $\alpha$ -sulfohydrylic acid, red-brown amorphous powder, decomp. above  $148^\circ$ . Reduction of III by  $\text{Zn}$  and concd.  $\text{HCl}$  gives oxindole- $\beta$ -acetic acid, m.  $218-9^\circ$ . Attempts to reduce this to scatolecarboxylic acid gave only traces of the latter. Diacetate, sinters  $225^\circ$ , m.  $228-30^\circ$ . Oxindole- $\alpha$ -amidodacetic acid amiline salt (IV), from  $\text{PhNH}_2$  and III at  $140^\circ$ , yellow, m. (not sharply)  $232^\circ$ . The free acid, citron-yellow, m.  $232^\circ$ . *Ag salt*, unstable and decompd. by boiling  $\text{H}_2\text{O}$ .  $\text{HCl}$  and IV in boiling  $\text{AcOH}$  give oxindoleglyoxylic acid, orange, m.  $265-70^\circ$  (decompn.). This did not result by the action of  $\text{NH}_4\text{OH}$  upon III. Attempts to prep. the oxime

resulted in the formation of indisoxazole- $\gamma$ -carboxylic acid,  
 $\text{C}_8\text{H}_4\text{C} \begin{array}{c} \text{---} \text{CO}_2\text{H} \\ \text{NH} \text{---} \text{C} \text{---} \text{O \text{---} N} \end{array}$

golden yellow, m. 251°. Soln. in  $\text{NH}_4\text{OH}$  and treatment with  $\text{AgNO}_3$  gives the *Ag* salt of  $\alpha$ -oximidooxindolacetic acid, which is not decompd. by boiling  $\text{H}_2\text{O}$ . *Sulfo-phenyloxindol-8-aldehyde*, brownish yellow, decomp. 155–60°, results by the action of  $\text{PhSO}_2\text{Cl}$  upon oxindolaldehyde in 10%  $\text{NaOH}$ . *Benzoyloxindol-8-aldehyde*, yellow, m. 192°. *Rhodanal-N-methyloxindole*, from I and *N*-methylsatin, dark red.

C. J. Wzsr


**Halogen derivatives of ketodihydrobenzo-1,4-thiazines and their transformation products.** Conversion of thiazine into thiazole compounds. K. ZAHN. *Ber.* 56B, 578–87 (1923).—3-Keto-2,3-dihydrobenzo-1,4-thiazine ( $S = 1$ ) (I), and its derivs. with Br under ordinary conditions give only mono-Br derivs. but with Cl or  $\text{SO}_2\text{Cl}_2$  are obtained mono- (II) and di-Cl derivs. (III), depending on the amt. of the reagent and on the solvent or diluent.  $\text{C}_6\text{H}_6$  is best adapted for the prepn. of II,  $\text{PhNO}_2$  for that of III. The influence of the solvent probably depends on its greater or lesser ability to dissolve the II first formed. The halogen in all cases is substituted exclusively on the  $\text{CH}_3$  group of the thiazine ring (C atom 2). In II, already, the halogen is very reactive; on heating with alcs. it is replaced with formation of 2-alkyloxy derivs. (IV) of I, which dissolve in dil. aq., more easily in alc. alkalies, with enolization, and are reprecipitated, unchanged by acids; the presence of an O atom (as alkoxy) on C atom 2 therefore renders the remaining 2-H atom labile and capable of enolization. With  $\text{Me}_2\text{SO}_4$  in alkali the IV do not give the *O*-Me ethers of the enolic forms of IV, but the 2-Me derivs. With concd.  $\text{H}_2\text{SO}_4$  at room temp. the II evolve HCl; the resulting 2-HO derivs. of I, however, at once react further with the  $\text{H}_2\text{SO}_4$  and form anhydrides. The HO derivs. have thus far not been isolated but their acetates are easily obtained from the II with  $\text{NaOAc}$  in  $\text{AcOH}$ . The II react with aromatic amines, phenols, thiophenols and  $\text{HSCH}_2\text{CO}_2\text{H}$  just as readily as with alcs. The III are extraordinarily reactive. The most striking property of the 2,2-disubstituted derivs. of I is the relative instability of the thiazine ring and the surprising ease with which they change into 5-membered thiazole compds. On short treatment with  $\text{MeOH}$  both Cl atoms in the III are replaced by  $\text{MeO}$  with formation of acetal-like compds. which, on further treatment with  $\text{MeOH}$  (easily with  $\text{EtOH}$ ), change into esters of benzothiazole-2-carboxylic acid ( $S = 1$ ) (V). With concd.  $\text{H}_2\text{SO}_4$ , which at first dissolves the III with intense halochromic phenomena, the III are hydrolyzed in the cold in a few sec. (also on heating with  $\text{AcOH}$ ) with formation of derivs. of 2,3-diketodihydrobenzo-1,4-thiazines (VI), decompd. by dil. alkalies first into  $\text{O-HSC}_6\text{H}_4\text{NHCOCO}_2\text{H}$  and then into  $\text{HSC}_6\text{H}_4\text{NH}_2$  and  $(\text{CO}_2\text{H})_2$ .  $\text{PhNH}_2$  and  $\text{PhNHNH}_2$  likewise break the ring at the S atom with formation of derivs. of V. With aromatic amines,  $\text{N}_2\text{H}_4$  and  $\text{PhNHNH}_2$  the III yield the anils, azines and phenylhydrazones, resp., of VI with extraordinary ease. The anils, boiled with alc. or  $\text{AcOH}$ , change into the anilides of V. With compds. contg. reactive  $\text{CH}_3$  groups (indoxyl, hydroxythionaphthene) the III smoothly form compds. of indigoid structure. Derivs. of I: 2-Br, decomp. about 220°, sol. in concd.  $\text{H}_2\text{SO}_4$  with yellow-red color changing to violet on heating. 2-Cl, decomp. 215°, sol. in  $\text{H}_2\text{SO}_4$  with red color becoming violet on standing. 2,7-Dichloro-5-methyl, obtained by chlorination of the 7-chloro-5-methyl deriv., darkens 200°, decomp. about 245°, sol. in  $\text{H}_2\text{SO}_4$  with green color and red dichroism. 2-Chloro-7,8-benzo,  $\text{C}_6\text{H}_4\text{C}_6\text{H}_2\text{NH.CO.CHClS}$ , darkens

above 200° and gradually decomp., sol. in  $\text{H}_2\text{SO}_4$  with dark blue color. 2-MeO, m. 188–9°, sol. in  $\text{H}_2\text{SO}_4$  with brown-red color changed to dark blue by addn. of a particle of  $\text{K}_2\text{Cr}_2\text{O}_7$ . 2-EO, m. 168–9°, sol. in  $\text{H}_2\text{SO}_4$  with red color. 2-Methoxy-5-methyl-7-chloro, faintly brownish, m. 189–90°, sol. in  $\text{H}_2\text{SO}_4$  with green color. 2-Ethoxy-5-methyl-7-chloro, m. 197°. 2-Methoxy-7,8-benzo, m. 223–4°, sol. in  $\text{H}_2\text{SO}_4$  with dark blue color. 2-Ethoxy-7,8-benzo, m. 208–9°. 2-Methyl-2-methoxy, m. 80–1°, sol. in  $\text{H}_2\text{SO}_4$  with brown-red color. 2-AcO, m. 172–3°, gives  $\text{AcOEt}$  and the above 2-EO deriv. on warming in alc. with a little  $\text{H}_2\text{SO}_4$ , and with concd.  $\text{H}_2\text{SO}_4$  at 50° yields the anhydride  $(\text{S.C}_6\text{H}_4\text{NH.CO.CH})_2\text{O}$  (obtained in the same way from the 2-Cl deriv.),

decomp. above 300°, sol. in hot dil.  $\text{NaOH}$  with yellowish, in  $\text{H}_2\text{SO}_4$  with violet color changed to dark blue by  $\text{K}_2\text{Cr}_2\text{O}_7$ . 2,2-Cl<sub>2</sub>, m. 195–6°, sol. in  $\text{H}_2\text{SO}_4$  with dark red color and immediate evolution of HCl, the color becoming yellow, sol. in  $\text{PhOH}$  with violet-blue color. 2,2,7-Trichloro-5-methyl, m. 205–6°, sol. in  $\text{H}_2\text{SO}_4$  with dark green color changing to yellow, in  $\text{PhOH}$  with dark blue color. 2,2-Dichloro-7,8-benzo, light yellow, decomp. about 240°, sol. in  $\text{H}_2\text{SO}_4$  with dark blue color changing to brown, in  $\text{PhOH}$  with green-blue color. 2,2-(MeO)<sub>2</sub>, m. 129–30°, sol. in  $\text{H}_2\text{SO}_4$  with orange-red color. 2,2-Dimethoxy-5-methyl-7-chloro, m. 203–4°, sol. in  $\text{H}_2\text{SO}_4$  with orange-red color. 2,2-Dimethoxy-7,8-benzo, faintly yellow, m. 171–2°, sol. in  $\text{H}_2\text{SO}_4$  with violet

color, converted by long heating with MeOH into *Me 6,7-benzobenzothiazole-2-carboxylate*, m. 119°; *Et ester*, faintly yellow, m. 129-30°; *amide*, m. 253-4°; *free acid*, m. 141°, giving *6,7-benzobenzothiazole (methenyl-(2-aminonaphthyl-1-mercaptan))*, m. 62-3°. *Et 4-methyl-6-chlorobenzothiazole-2-carboxylate*, m. 97-8°; *amide*, m. 250-1°; *free acid*, m. 140°, forming *4-methyl-6-chlorobenzothiazole*, m. 60-1°, b. 273°. VI, m. 250° (decompn.), decmps. on long boiling with AcOH or H<sub>2</sub>O into benzothiazole and CO<sub>2</sub>, forms with PhNH<sub>2</sub> in hot AcOH the anilide, m. 157-8°, of V and with PhNHNH<sub>2</sub> the pale yellow *phenylhydrazide*, m. 220-2°, sol. in concd. HCl and in dil. NaOH with yellow color. *2-Anil* of VI, light yellow, m. 254-6°. *5-Methyl-7-chloro deriv.* of VI, m. 255° (decompn.); *2-anil*, golden yellow, m. 247-8°, sol. in concd. HCl with yellow-brown color, changes on long boiling with alc. into *4-methyl-6-chlorobenzothiazole-2-carboxanilide*, m. 140-1°. *7,8-Benzo deriv.* of VI, yellow, decmps. 315°; *2-anil*, m. 290-2°; *6,7-benzobenzothiazole-2-carboxanilide*, m. 202-3°. *2-Phenylhydrazone* of VI, yellow-brown, m. 270-2° (decompn.), sol. in H<sub>2</sub>SO<sub>4</sub> with brown-red color. *Azine*, bright orange-red powder sol. in H<sub>2</sub>SO<sub>4</sub> with red-violet color. With hydroxythionaphthene in alc. or AcOH the 2,2-Cl<sub>2</sub> deriv. of I yields 2-[dihydrobenzo-1,4-thiazine]-2'-[thionaphthene]indigo, identical with the product obtained by Herzog from I with 2,3-diketodihydrothionaphthene-2-anil (C. A. 14, 2193).

**Arthionium salts of the naphthalene series.** II. F. KEHRMANN, ALFRED GRESSLY, WLADIMIR CHIFFÈRE AND MARIE RAMM. *Ber.* 56B, 649-54(1923); cf. C. A. 15, 2879.—*Thio-α,β-dinaphthylamine* (I), from *α,β-dinaphthylamine* and S at 240°, light orange-yellow, m. 185-6°, is sol. in boiling C<sub>6</sub>H<sub>6</sub> with golden yellow color and distinct green fluorescence. Treated with the appropriate oxidizing agents it readily yields the relatively stable *α,β-dinaphthazthionium salts: nitrate*, C<sub>10</sub>H<sub>7</sub>N<sub>2</sub>O<sub>3</sub>S.H<sub>2</sub>O, from I in H<sub>2</sub>O with an equal vol. of concd. HNO<sub>3</sub>, crystals with bronze luster, sol. in H<sub>2</sub>O with intense violet-red color, the soln. being relatively stable, especially in the presence of some free acid, but decomp. quite rapidly on boiling with decolorization and deposition of the dark brown flocks of *α,β-dinaphthothiazine: perchlorate*, from I in warm AcOH with HClO<sub>4</sub> and a few drops of concd. aq. NaNO<sub>3</sub>, dark violet ppt. slightly sol. in H<sub>2</sub>O and org. solvents with violet, in concd. H<sub>2</sub>SO<sub>4</sub> with greenish blue color changing to pure violet on addn. of H<sub>2</sub>O; *picrate*, from I with alc. picric acid and FeCl<sub>3</sub>, dark violet. *α,β-Dinaphthothiazine*, from I in AcOH with FeCl<sub>3</sub> in H<sub>2</sub>O-AcOH, dark brown-red, m. 256-7°, sol. in org. solvents with fuchsin, in H<sub>2</sub>SO<sub>4</sub> with blue-violet color changed by H<sub>2</sub>O to violet-red with subsequent pptn. of the thiazine in brown flocks. *Thio-α,α-dinaphthylamine* (II) (cf. C. A. 17, 767), m. 164-6° in sealed tubes under CO<sub>2</sub>, oxidizes in the solid state and still more in soln. with extraordinary ease in the air to the thiazine, dissolves in C<sub>6</sub>H<sub>6</sub> and CHCl<sub>3</sub> with orange-red color when freshly prepd. *Ac deriv.*, from II shaken a short time with ZnCl<sub>2</sub> and Ac<sub>2</sub>O, m. 214-5°. *α,α-Dinaphthazthionium salts: Nitrate*, from II in AcOH with concd. HNO<sub>3</sub>, brown needles with Cu luster; *perchlorate*, sol. in H<sub>2</sub>SO<sub>4</sub> with violet-blue color changed to violet-red by H<sub>2</sub>O; *chloroferrate*, dark blue-violet, sol. in H<sub>2</sub>O with violet color, the soln. becoming colorless and depositing the brown thiazine on long standing, more quickly on boiling. *α,α-Dinaphthothiazine* (Ann. 322, 56(1902)), brown, m. 245° (the *α,β*-isomer, m. 257-8°), sol. in C<sub>6</sub>H<sub>6</sub> and alc. with fuchsin-red, in H<sub>2</sub>SO<sub>4</sub> with bluish green color changed by H<sub>2</sub>O to blue-violet and then colorless, with pptn. of the thiazine, while the *α,β*-compd. dissolves with blue-violet color changed to violet-red and then colorless by H<sub>2</sub>O. N-

*Phenyl-α,α-dinaphthothiazine*, PhN: C<sub>10</sub>H<sub>6</sub>  C<sub>10</sub>H<sub>8</sub>, from the above chloroferrate in

80% alc. with 1-2 mols. PhNH<sub>2</sub>.HCl and an excess of PhNH<sub>2</sub>, crystals with black luster, m. 250-4°, sol. in C<sub>6</sub>H<sub>6</sub> with red-violet, in H<sub>2</sub>SO<sub>4</sub> with brown-red color changed by ice to dark blue with sepn. of a sulfate in blue flocks. *α,α-Dinaphthothiazine*, from the chloroferrate and alc. NH<sub>3</sub>, yellowish red cryst. crusts; *chloroplatinate*, dark violet-brown; *HCl salt*, black-violet; *perchlorate*, sol. in H<sub>2</sub>SO<sub>4</sub> with blue color changed by H<sub>2</sub>O to violet.

C. A. R.

**Action of caustic potash on chloroacet-*p*-anisidine.** FRÉDÉRIC REVERDIN. *Helvetica Chim. Acta* 6, 424-8(1923).—*p*-MeOC<sub>6</sub>H<sub>4</sub>NHCOCH<sub>2</sub>Cl (I) warmed 8 hrs. with 4% KOH added in small portions as long as the base was consumed yielded a thick oil which soon solidified. This in hot alc. gave crystals, m. 185-6°, probably resulting from the condensation of 3 mols. of I minus C<sub>2</sub>H<sub>5</sub>OCl<sub>2</sub>. I with 10% KOH gave a compd. m. 257-8°, probably resulting from the condensation of 2 mols. of I with elimination of HCl, and the product is very probably *di-*p*-methoxy-α,γ-diacylphiperazine* or *dincelo-2,5-di-1,4-(oxyphenyl-4)-1,4-hexahydrodiazine*. The results show that I behaves in a manner very different from the NO<sub>2</sub> derivs. (cf. C. A. 17, 1794).

H. E. W.

**The preparation of nucleotides from yeast nucleic acid.** WALTER JONES AND M. E. PERKINS. *Bull. Johns Hopkins Hosp.* 34, 63-5 (1923); cf. *C. A.* 17, 2117.—When yeast nucleic acid is digested with a boiled aq. ext. of pancreas which contains nucleic acidase as the only enzyme, two dinucleotides are produced and no titratable acidity even to phenolphthalein appears. These facts would indicate that the 4 mononucleotides are linked together in the following manner: (1) carbohydrate to  $H_2PO_4$  group, (2) carbohydrate to carbohydrate, (3)  $H_2PO_4$  group to carbohydrate. The nucleotide linkage No. 2 is the one ruptured by the action of boiled pancreas ext. A chem. process has been devised by which the rupture of linkages Nos. 1 and 3 can be brought about, giving two mono- and one dinucleotide, the latter finally giving rise to simple mononucleotides. Details of this chem. method will be published in the near future. Expts. are in progress to establish the identity of the nucleotides and to det. whether the uracil group is actually present in the nucleic acid mol. or whether all uracil derivs. hitherto obtained from nucleic acid are lab. products referable to the deaminization of their corresponding cytosine precursors. A. P. LOTHROP

The acid decomposition of iron and manganese carbide alloys [formation of hydrocarbons] (SCHENCK) 6. Effect of heating cellulose and lignin under pressure in presence of water and aqueous alkalis (FISCHER, SCHRADER) 23. Effect of heating under pressure the alkaline solutions obtained in the pressure oxidation of cellulose and lignin (FISCHER, *et al.*) 23. Refractometric study of organic F compounds (SWARTS) 2. Rate of hydrogenation of cinnamic and phenylpropionic acids (RIDEAL) 2. Study of absorption in the ultraviolet of a series of camphor derivatives (HALDER, LUCAS) 3.

**Succinic acid.** J. F. NORRIS and E. O. CUMMINGS. U. S. 1,457,791, June 5. A dispersion of  $C_6H_5(COOH)_2$  in a dil. soln. of  $H_2SO_4$  or other acid which will not react with electrodes employed is electrolytically reduced. Either fumaric or maleic acid may be used as starting material.

**Purifying crude acetic acid.** F. O. ATKINSON. U. S. 1,457,484, June 5. Impurities are removed from crude HOAc, produced by destructive distn., by contact with animal matter having an affinity for the impurities, *e. g.* animal skins.

**Ethyl acetate.** A. A. BACKHAUS. U. S. 1,454,462, May 8. EtOAc is formed from HOAc and alc. (with  $H_2SO_4$  as a catalyst) in a column which is heated to maintain the top at about  $80^\circ$ , and the evolved distillate is conducted into a sepp. column heated to maintain its top at about  $70^\circ$ , from the bottom of which alc. is returned to the first column. Distillate is mixed with  $H_2O$  and after sepn. has been allowed to take place the ester layer is distd. to form a const. boiling mixt. and a coned. EtOAc. The const. boiling mixt. contg. EtOAc, alc. and  $H_2O$  may be used for continuing the process. U. S. 1,454,463 also relates to the manuf. of EtOAc and distn. of the product in a column still.

**Diphenylene diketones.** G. PETERS. U. S. 1,455,448, May 15. Diphenylene-diketones are formed from anthracene, oxanthranole, monochloroanthracene or dichloroanthracene by the use of O carriers such as N oxides, nitrosyl chloride, or  $HNO_2$  in a vehicle such as glacial HOAc with catalysts, *e. g.* oxides of Co, Ni, Fe or Mn or their sulfates, nitrates, acetates or propionates. Anthraquinone may be thus formed from anthracene or its derivs. or anthraquinonedisulfonic acids may be formed from anthraquinenedisulfonic acids. Inert diluents such as dichlorobenzene or  $PhNO_2$  may be added to the reaction mixt.

**4,4'-Dihydroxynaphthyl-1,1'-ketone-3,3'-dicarboxylic acid.** G. DE MONTMOLLIN, J. SPELER and G. BONNOTE. U. S. 1,453,659, May 1. In the course of the process described in U. S. pat. 1,387,596 (*C. A.* 15, 4053) there is formed from reaction of tetrahalogenized methane derivs. on 1-hydroxynaphthalene-2-carboxylic acid (besides the dye produced) 4,4'-dihydroxynaphthyl-1,1'-ketone-3,3'-dicarboxylic acid and 1-hydroxynaphthalene-2,4-dicarboxylic acid. The former of these 2 compds. is sepd. from the reaction mixt. by pptn. with HCl, redissolving with NaOH, repptn. with NaCl and subsequent recrystn. and liberation of the free acid, which is a sol. whitish powder decomposing at about  $259^\circ$ . The mother liquor from which this compd. has been removed may be acidified, the ppt. formed treated with  $Ba(OH)_2$  soln. and the liquor thus obtained acidified to obtain white flocks of 1-hydroxynaphthalene-2,4-dicarboxylic acid.

**Mercury derivative of diallylmalonic acid.** W. SCHOELLER. U. S. 1,457,675, June 5. Ethyl diallylmalonate and Hg sulfate, when heated in dil. alc., followed by sapon. with NaOH, yield a product which crystallizes from hot aniline as a free carboxylic

acid in the form of glistening plates nearly insol. in the ordinary org. solvents and forming sol. salts with alkali metals and double salts with alkali salts of amino acids. These compds. generally have *therapeutic properties* adapting them for use in the treatment of syphilis.

**Apparatus for producing ketones from secondary alcohols.** R. R. WILLIAMS and H. L. J. HALLER. U. S. 1,450,569, Apr. 3. Vapors of secondary alc. from a still are led with air or O through a heat-interchange device through which the final reaction product also passes and thence to a catalytic chamber contg. a coil of wire gauze of Cu-Zn alloy. Connections are also provided for supplying liquid alc. directly to the heat-interchange device in which it may be vaporized without use of the still.

**Chlorohydrins.** C. O. YOUNG. U. S. 1,456,959, May 29. Olefinic gas or vapor is allowed to react with a soln. contg. free HClO to the amt. of 0.09% or less and a hypochlorite, *e. g.*, NaOCl 5-7%, to prep. chlorohydrin free from ethylene and propylene chlorides. Free HClO is generated from residual hypochlorite and used for continuing the process with additional olefins.

**Chlorohydrins from olefins.** G. O. CURME, JR. and C. O. YOUNG. U. S. 1,456,916, May 29. Olefins are subjected to reaction with a soln. contg. free HClO and a hypochlorite, *e. g.*, NaOCl, to obtain chlorohydrin material substantially free from ethylene or propylene chlorides. HClO is set free from the residual hypochlorite and used for the treatment of additional olefin material.

**Chlorohydrins from gaseous olefins.** B. E. ELDRED. U. S. 1,456,590, May 29. Successive portions of Cl and gases comprising olefins such as oil gas are added to a flowing stream of steam while permitting time for reactions between the successive addns. The operation may be carried out in reaction towers.

**Aromatic amino compounds from nitro compounds.** O. W. BROWN and C. O. HENKE. U. S. 1,456,969, May 29. PhNO<sub>2</sub> or a similar aromatic nitro compd. in the gaseous state is mixed with H or a H-contg. gas and subjected to a catalyst contg. Sn and Sn oxide or other Sn compd. at 200-350° to obtain the corresponding amino compd., *e. g.*, PhNH<sub>2</sub>.

**Nitrating solid aromatic hydrocarbons.** S. P. MILLER and J. R. HESS. U. S. 1,457,543, June 5. Normally solid aromatic hydrocarbons such as C<sub>10</sub>H<sub>8</sub> are introduced in a molten state into a relatively cool liquid such as 55.5% H<sub>2</sub>SO<sub>4</sub> and are nitrated with HNO<sub>3</sub> before removal from the liquid.

**Phosgene.** D. R. BRADNER. U. S. 1,457,493, June 5. Cl is treated with a mixt. of CO and a large amt. of N and CO<sub>2</sub> or other inert gas and the phosgene formed is recovered by absorption in cold silica gel.

**Formaldehyde.** FARBWERKE VORM. MEISTER, LUCIUS, & BRÜNING. Brit. 189,432, Oct. 9, 1922. HCHO is produced by passing a mixt. of CH<sub>3</sub>Cl vapor and water vapor at a raised temp. over a porous body, such as pieces of clay, infusorial earth, ordinary or activated wood charcoal. The condensate consists of a HCl soln. of HCHO.

**Aldehyde-ammonia.** H. W. MATHESON. U. S. 1,456,702, May 29. Equimol. proportions of Ach and NH<sub>3</sub> are passed into EtOAc, preferably at a temp. of about 20° or lower, and aldehyde-ammonia is removed from the EtOAc by continuously circulating it through a filtering app. MeOAc, AmOAc, vinyl acetate or aldehyde may also be used as solvents. Cf. C. A. 16, 3904.

**Urea.** SOC. DES PRODUITS AZOTÉS. Brit. 189,787, Nov. 28, 1922. Urea is sepd. from acid solns. by concg. to such a degree that only urea can be deposited, cooling to 0°, and allowing to crystallize, when the whole of the acid remains in soln. The concn. may be effected entirely by evapn. *in vacuo*, or part of the H<sub>2</sub>O may first be frozen out at -10-5°. In an example the soln. is concd. until it contains 2-3 parts of urea to 1 part of H<sub>2</sub>O.

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

**Oxidizing enzymes in tea.** J. J. B. DEUSS. *Chem. Weekblad* 20, 253-4(1923).—D. reviews unpublished investigations made in the Dutch Indies by Bernard and Welter. B. and W. ppt. by means of alc. the juice pressed from fresh tea leaves. The flocky ppt. obtained contains an oxidizing enzyme sol. in water, which colors guaiac resin. It contains C, O, N, P, Mn, Mg, K, but no Fe. The velocity of the oxidizing

action depends on the diln. It is destroyed by heating to 100°, or by a low concn. of acid;  $\text{CHCl}_3$  retards the action; acetone accelerates it. This oxidase is assumed to play a role in the fermentation of tea.

R. BEUTNER

**Interfacial phenomena with reference to colloid and enzymes. The excitatory state. Vasomotor reactions.** W. M. BAYLISS. *Bull. Johns Hopkins Hosp.* 33, 347-50, 412-6(1922).—Herter lectures. Cf. *C. A.* 16, 3668.

H. G.

**The intravital transformation of inorganic bromines into organic.** T. YOSHITOMI. *Acta Schol. Med.* (Kyoto) 3, 729-32(1920); *Physiol. Abstracts* 7, 549.—Bromides are stored in the body (chiefly liver and kidneys) as org. compds., which are sol. in petr. ether.

H. G.

**New investigations on tyrosinase.** R. CHODAT AND F. WYSS. *Compt. rend. soc. phys. hist. nat. Genève* 39, 22-6(1922); *Physiol. Abstracts* 7, 570.—The authors insist on the importance of obtaining for exptl. work tyrosinase which is free of peroxidase and amino acids. The properties of pure tyrosinase are outlined, doubt being cast on much of the earlier work on account of the impurities present with the enzyme. H-ion concn. can be an important factor in tyrosinase reactions.

H. G.

**Coagulation of blood.** ROSA RABINOVICH. *Anal. asoc. quim. Argentina* 10, 335-60, 380-98(1922).—The action of cobra venom on thrombin and various anticoagulants was detd. by expts. It has no effect on hirudin. Its action on the antithrombins prepd. from peptonated plasma and by the methods of Howell and of Doyon is intense and varies with the amt. of venom and the time of contact. It impedes the formation of antithrombin Howell at the expense of the heparin and proantithrombin. It impedes the attenuation of ordinary thrombin, destroying the antithrombin of the serum and at the same time impeding its regeneration from its primary sources. It has no action on thrombin Howell and accelerates its union with the fibrinogen of the plasma since it destroys the antithrombin. Of the 3 physiol. antithrombins that of Doyon has a very weak anticoagulant action; on the other hand the peptonated plasma from which it is prepd. and antithrombin Howell both are very active. To the already known properties of cobra venom (anticytozyme, anticoagulant, antiprothrombin, and destroyer of nucleoproteins), must be added a new property, anti-antithrombin. Extensive exptl. data are given in tabulated form.

L. E. GILSON

**Some compounds extracted from human skeletal muscles.** R. ENGELAND AND W. BIEHLER. *Z. physiol. Chem.* 123, 290-4(1922).—The following compds. have been isolated from human skeletal muscles: carnitine,  $\text{C}_7\text{H}_{15}\text{O}_2\text{N}$ ; neosine,  $\text{C}_8\text{H}_7\text{O}_2\text{N}$ ; myokynine,  $\text{C}_{11}\text{H}_{25}\text{O}_4\text{N}_2$ ; and *mirgeline* isolated as the *chlorosulfate*,  $\text{C}_{11}\text{H}_{25}\text{O}_4\text{N}_2\cdot\text{HAuCl}_4$ , light yellow, nodular crystals.

J. C. S.

**Physico-chemical basis of psychic phenomena.** J. S. HUGHES AND H. H. KING. *Science* 57, 590-1(1923).—Nervous tissue is a 2-phase system of 2 immiscible liquids, a lipid phase and a  $\text{H}_2\text{O}$  phase. Any substance which is sol. in the lipid phase and will lower its surface tension, but which will not dissolve in the  $\text{H}_2\text{O}$  phase, will tend to give a more continuous lipid phase and a less continuous  $\text{H}_2\text{O}$  phase. Since the lipid phase is a poorer conductor than the  $\text{H}_2\text{O}$  phase, nerve cond. will be reduced as the lipid phase becomes more continuous, and such a substance will produce narcosis. A substance sol. in the  $\text{H}_2\text{O}$  phase, but not in the lipid phase, will lower the surface tension of the  $\text{H}_2\text{O}$  phase, tending to make it more continuous, thereby increasing the cond. of the nerve and acting as a nerve stimulant. The exptl. basis of this theory, which explains many well known phenomena of narcosis, is being studied.

H. B. LEWIS

**The endothermic reaction which accompanies the appearance of a visible curd in milks coagulated by heat: a contribution to the theory of the heat coagulation of milk.** ALAN LAUGHTON AND C. S. MUDGE. *J. Biol. Chem.* 56, 53-73(1923).—An endothermic chem. reaction accompanies the heat coagulation of milk, the reaction apparently being a pptn. of Ca and Mg as citrates and phosphates in which the metals combined with the protein are also concerned. The thickening of condensed milk sometimes occurring during storage is the result of a chem., not a bacteriological, reaction which can be prevented by a high forewarming at 110-120° and perhaps by a 30 min. forewarming at 95°. A preliminary 10 min. forewarming of evapd. milk at 95° stabilizes the product; if done at 100°, the product is slightly unstabilized and, if done at 120°, it is decidedly unstabilized. Similar forewarming treatments of condensed milk give exactly opposite results. A prolonged forewarming of condensed milk at 95° first unstabilizes and then stabilizes the finished product as shown by heat absorption tests. Sugar exerts a very definite effect on the stability of condensed milk but there is yet insufficient data to warrant conclusions as to the nature of the reaction. L. and M. "feel justified in hazarding the opinion that the controlling factor which determines the stability of milks toward the action of heat is the equil. of the salts of the milk, and

that the effects of forewarming upon the stability of milk samples under further heating are the effects produced by altering this equil. Since sucrose solns. dissolve Ca phosphate and citrate and can also form compds. with both Ca and P, it seems probable that the effect of cane sugar will also be explained by its action upon that equil. Any denaturation or dehydration of the protein before pptn. is believed to be a secondary reaction."

A. P. LOTHROP

**Proteins of the cantaloupe seed, *Cucumis melo*. Isolation of a crystalline globulin, and a comparative study of this globulin with the crystalline globulin of the squash seed, *Cucurbita maxima*.** D. B. JONES AND C. E. F. GERSDORFF. *J. Biol. Chem.* **56**, 79-96 (1923).—A globulin, crystg. in octahedra, can be extd. in 28.21% yield with 2% NaCl soln. at 60° from R<sub>2</sub>O-extd. meal of bulled cantaloupe seed. The globulin has the following % compn.: C 52.65, H 6.67, N 18.41, S 1.13. Diamino acids are present as follows: arginine 16.26, histidine 4.22, lysine 3.29, cystine 1.27 and tryptophan 2.83%. A comparison of the chem. and physical properties of the cantaloupe seed globulin with those of the globulin of the squash seed similarly prepd. showed no point of difference between these two proteins. Anaphylaxis expts. on guinea pigs also showed that these two proteins could not be distinguished immunologically. Extn. of the R<sub>2</sub>O-extd. cantaloupe seed meal with 0.5% NaOH yields a glutelin, analyses of which gave the following results: C 55.20, H 7.02, N 16.28, S 0.90, arginine 12.42, histidine 2.72, lysine 4.59, cystine 1.09, tryptophan 3.03%. Careful examn. failed to reveal the presence of an albumin or of more than one globulin in the seed.

A. P. LOTHROP

**A new sulfur-containing amino acid isolated from the hydrolytic products of protein.** J. H. MUELLER. *J. Biol. Chem.* **56**, 157-69 (1923); cf. *C. A.* **17**, 1969.—A new amino acid, having apparently the formula C<sub>5</sub>H<sub>11</sub>SN<sub>2</sub>O<sub>2</sub>, has been isolated from the H<sub>2</sub>SO<sub>4</sub> hydrolysis products of several proteins such as casein, egg albumin, edestin and wool, and from casein also after hydrolysis with NaOH. The yield from casein varied from 0.2 to 0.4% and probably was not quant. The evidence indicates that it is not a secondary decompn. product but is present as such in the protein and will account for at least a part of the non-Pb blackening or firmly bound S. The structure has not yet been detd. but the compd. apparently contains a CO<sub>2</sub>H group and the N is present as NH<sub>2</sub> as it is given off quant. in the Van Slyke amino-N app. in 3 min. In an open capillary the crystals turn brown and shrink at 278° and melt with decompn. at 283°; in a closed capillary these changes occur at 274 and 280-281°, resp.  $[\alpha]_D^{20} = 7.2^\circ$ ; it is possible that the compd. is partially racemized by extn. with hot Ba(OH)<sub>2</sub> soln.

A. P. LOTHROP

**A spontaneous crystallization of a Bence-Jones protein.** D. W. WILSON. *J. Biol. Chem.* **56**, 203-14 (1923).—The Bence-Jones protein described crystd. spontaneously from the urine as passed in a cryst. structure in appearance similar to freshly crystd. egg albumin. Dried preps. were made which could be recrystd. The cryst. protein contained a ratio of amino N to total N of 4.86%, indicating that the compd. should be classed as a protein and not as an albumose. Unsuccessful attempts were made to crystallize other Bence-Jones proteins. This is apparently the first time that a Bence-Jones protein has been observed to crystallize spontaneously in the urine as passed and, with one exception, is the only observation of any protein crystg. spontaneously from urine.

A. P. LOTHROP

**A study of the variation in enzymatic power of the urease from *Soja hispida* according to the age of the beans.** A. VOSKRESSENSKY. *Compt. rend. soc. biol.* **88**, 498-500 (1923).—Prepns. made from beans dating from 1905 were almost twice as powerful as those from 1922 beans.

S. MORGULIS

**Enzyme action. XXIII. The spontaneous increase in sucrase activity of banana extracts.** GRACE MCGUIRE AND K. GEORGE FALK. *J. Am. Chem. Soc.* **45**, 1539-51 (1923); cf. *C. A.* **17**, 775.—The sucrase action of banana exts. increases on standing from 40 to 100% and then decreases. The increase is independent of the compn. of the extg. soln. or of the preservative present; banana cells and bacteria were absent during the increase. The increase in activity is not accounted for by changes in the H-ion concn. Results of sucrase action at different H-ion concns. and different ages of ext. are given. Rise in temp. increases the rate of increase in activity. Possible explanations of the increase in activity are discussed.

C. A. R.

**Experiments for studying the movement of liquids in the cellular massive.** PIERRE LESAGE. *Compt. rend.* **175**, 47-50 (1922).—App. was constructed of bladder, of aceto-cellulose and of Cu ferrocyanide membranes for showing the movement of liquids. The 2 most important factors affecting the results were osmotic pressure and the pressure of turgescence.

L. W. RIGGS

**Note of L. Lapique on the mechanism of the exchanges between the cell and its**

**surrounding medium.** PIERRE GIRARD. *Compt. rend.* 175, 64-5(1922); cf. Lapique, *C. A.* 16, 3320.—G. holds that it is impossible to measure the osmotic pressure of the living cell.

L. W. RIGGS

**The ostensible auxo- and anti-fermentative properties of serum.** A. BACH, B. SHARSKY AND K. NIKOLAJEV. *Biochem. Z.* 135, 32-8(1923).—Mammalian serum has an accelerating effect on perhydridase and urease. On the oxidative processes displayed by phenolase, either acceleration or retardation is seen. This is detd. by the optimum  $C_H$  for the action of the enzyme on the given substrate, since in buffered solns. the effect is lost. Some protein solns. have the same effect as serum. Before one can ascribe an auxo- or anti-fermentative substance to serum, it is necessary to take into account its buffer action, salt content, and colloidal properties.

GEORGE ERIC SIMPSON

**Antiphenolase (antilaccase).** A. BACH AND W. ENGELHARDT. *Biochem. Z.* 135, 39-45(1923); cf. preceding abstract.—The presence of antiphenolase in the serum of animals which had subcutaneous injections of phenolase (cf. Gessard, *Compt. rend. soc. biol.* 55, 227(1903)) is confirmed. The anti-effect is exhibited not only with guaiacol but also with pyrogallol, a substrate acted on optimally in alk. reaction, and hence cannot be ascribed to  $C_H$  changes. It is displayed in buffered as well as non-buffered solns.; it is not due to differences in salt content of "immune" and normal serums. It is shown by the non-dialyzable part of the serum. It is not affected by moderate heating. It is destroyed by 30 mins. at 80° and the resulting serum shows the same action as normal serum. This antiphenolase effect is not to be ascribed to any hitherto known antiphenolase effect. After boiling, normal serums, "immune" serums, and protein solns. all inhibit phenolase action.

G. E. S.

**Behavior of cholesterol in pigeon beriberi.** HEINZ LAWACZECK. *Z. physiol. Chem.* 125, 229-47(1923).—The cholesterol content of skeletal muscle and blood is high in pigeon beriberi.

R. L. STEHLE

**The influence of cholesterol on the oxygen consumption of lecithin.** H. LANGE AND H. LAWACZECK. *Z. physiol. Chem.* 125, 248-57(1923); cf. preceding abstr.—When cholesterol was added in varying amts. to a lecithin-water- $FeCl_3$  system the O consumption was first increased and then decreased. Changes in the colloidal condition of the system also occurred so that an explanation of the mechanism is not apparent. It is suggested that the *low metabolism of beriberi* may be due to the high cholesterol content of the muscles.

R. L. STEHLE

**The proteolytic enzymes of the lymph glands.** S. G. HEDIN. *Z. physiol. Chem.* 125, 289-96(1923).—The same enzymes were found as in the case of the spleen (cf. *C. A.* 17, 112).

R. L. STEHLE

**The inactivation of saccharase by *p*-phenylenediamine, *p*-toluidine and formaldehyde.** H. V. EULER AND KARL MYRBÄCK. *Z. physiol. Chem.* 125, 297-314(1923).—The inhibitory action depends upon the amt. of free base present; impurities in the enzyme preps. are without effect. Even with  $HCHO$  the inhibitory action is strongest when the acidity is low.

R. L. STEHLE

**Indicator method for the determination of coefficients of diffusion in gels, with special reference to the diffusion of chlorides (STILES) 2.** Constitution of ampholytes, especially of the amino acids, and their dissociation constants (BJERRUM) 2. Bile acids. XIV (WIRLAND, SCHLICHTING) 10. Ergosterol of yeast (WINDAUS, GROSSKOPF) 10. The origin of creatine (THOMAS, *et al.*) 10.

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

**A rapid and sensitive method for the detection of bismuth in urine.** SERAFINO DEZANI. *Boll. chim. farm.* 62, 97-101(1923).—A reply to Ganassini (*C. A.* 17, 571). D. contends that the KI method in which an *instantaneous* yellow color is obtained in the presence of  $BiCl_3$ , in addition to being more sensitive than Ganassini's method, is absolutely specific for Bi in urine. In aq. soln. the sensitivity is 1:1,000,000, in urine 1:600,000. No other substance could possibly be excreted in the urine in sufficient amt. to give this test.

A. W. DOX

**Detection and estimation of acetoacetic acid in the urine of diabetics.** G. FAVREL. *Ann. chim. anal. chim. appl.* 4, 337-8(1922); *Repert. pharm.* 35, 33-5(1923).—A positive color reaction with  $FeCl_3$  soln. is not given by ketones and it is not the ketonic form of acetoacetic acid which gives the reaction, but the enolic form. In light-colored urines a well defined reaction is obtained by the direct addition of the reagent, but good results are not always obtained with dark-colored urines. In these cases, the



urine is usually acidified with AcOH, shaken with Et<sub>2</sub>O and the reagent applied to an aq. soln. of the residue obtained on evapg. the Et<sub>2</sub>O. A small amt. of AcOH is also extd. by the Et<sub>2</sub>O and this interferes with the reaction. To overcome this difficulty HCl is used in place of AcOH and the final soln. is neutralized with CaCO<sub>3</sub>. Both the ketonic and enolic forms are of equal pathological significance and where a quant. estn. is desired both forms should be detd. For this purpose the method of Denigès is recommended.

**Progress in the examination and judging of urine during 1922.** F. URZ. *Pharm. Monatshefte* 4, 45-52 (1923). A. G. DUMLTZ. W. O. E.

**A modified McClendon direct reading potentiometer for use at varying room temperatures.** R. N. NYE. *J. Med. Research* 42, 303-13 (1921); *Abstracts Bact.* 6, 47.—The instrument is described, and illustrations are given. It was devised for use in detg. the H-ion concns. of such fluids as exudates, tissue exts, and blood. It is less expensive than the more accurate potentiometers, and gives more accurate results than can be obtained by the colorimetric method. H. G.

**Method for the detection of urobilinogen.** F. HERZFELD. *Schweiz. med. Wochschr.* 52, 976-8 (1922); cf. *C. A.* 17, 1974. H. G.

**Estimation of dextrose in cerebrospinal fluid.** J. LANZA. *Anal. soc. españ. fis. quim.* 20, 400-2 (1922).—A picric acid method is used. L. E. GILSON.

**Estimation of uric acid in blood serum.** KARL HARPUEDER. *Klin. Wochschr.* 2, 209-10 (1923).—Mix 20 cc. serum in a 100-cc. flask with 2.5 cc. 0.10 N NaOH, 2 cc. of amyl alc. and 50 cc. of H<sub>2</sub>O. Add sufficient of a 1.6% uranium acetate soln. to ppt. the protein completely. Dil. to 100 cc. and filter. Treat 50 cc. of the filtrate with 5 cc. of a 2% ZnCl<sub>2</sub> soln., neutralize the mixt. and wash the ppt. with water by centrifugation. Dissolve the ppt. in 2 cc. of a 10% NaCN soln. Then add 2 cc. of a soln. of phosphotungstic acid and dil. to 100 cc. Compare colorimetrically after 10 min. Cf. Morris and Macleod, *C. A.* 16, 1103, 1111. MILTON HANKE

**Estimation of bilirubin in urine.** A. ADLER AND ELSE MEYER. *Klin. Wochschr.* 2, 258-9 (1923).—Treat 5 cc. of urine with 0.25 g. BaCl<sub>2</sub>. Suspend the coarsely granular ppt. in 10 cc. of a 10% HCl soln. in alc., agitate the mixt. and heat to 70-80° for a few min. In most cases a green color develops spontaneously. A color of max. intensity can be obtained by adding a few drops of H<sub>2</sub>O<sub>2</sub> to the mixt. The coloration is characteristic for bilirubin and the intensity of the color is a measure of the quantity of bilirubin present. MILTON HANKE

**A simple clinical method for the estimation of the alveolar carbon dioxide tension.** J. HOLLÓ AND ST. WEISS. *Klin. Wochschr.* 2, 697 (1923).—The subject exhales slowly and exhaustively through 3 cc. of a very dil. soln. of NaHCO<sub>3</sub> contg. *m*-nitrophenol. The concn. of CO<sub>2</sub> in the last of the expired air (alveolar) can be calcd. from the final *p*<sub>H</sub> of the NaHCO<sub>3</sub> soln. by the law of mass action. MILTON HANKE

**A clinical method for the estimation of blood fibrinogen.** G. LEENDERTZ. *Klin. Wochschr.* 2, 746-7 (1923).—The *n* of the citrated plasma is detd. before and after coagulation with the predetd. optimum concn. of CaCl<sub>2</sub>. The concn. of fibrinogen can then be calcd. from the formula (*R*<sub>1</sub> - *R*<sub>2</sub>)/0.215 *L*, where *L* is the diln. correction factor. The method is described in detail. MILTON HANKE

**A simple method for estimating bilirubin in blood serum.** EUGEN HERZFELD. *Deut. Arch. klin. Med.* 139, 306-9 (1922).—Into a series of test-tubes except the 1st, measure 1 cc. of H<sub>2</sub>O. Put 1 cc. of blood serum into the 1st 2 tubes. From the 2nd tube remove 1 cc. and put into the 3rd and so on until the mixt. becomes colorless (about 7 tubes are used). To each tube add, drop by drop, a freshly prepd. Hammarsten soln. This soln. is made by adding 1 vol. of 25% HNO<sub>3</sub> to 10 vols. 25% HCl. Mix 1 vol. of this mixt. with 4 vols. alc. The highest diln. of blood serum in which a green color is produced is taken as the end point and the no. of mg. per cc. of blood serum that this represents is obtained from a table given in the text. If the blood serum contains hemoglobin shake 2 cc. of it with 4 cc. of 96% alc. and a small bit of NaHCO<sub>3</sub>. After centrifuging put 3 cc. into the 3rd tube contg. 3 cc. of H<sub>2</sub>O. From this remove 3 cc. to the 4th tube also contg. 3 cc. of H<sub>2</sub>O, and so on. The results are read in the same way as above. The normal limits of bilirubin in blood serum lie between 1.6 mg. and 6.25 mg. per 100 cc. In pathological conditions it may be increased to 100 mg. per 100 cc. JULIAN H. LEWIS

**A micro-method for non-protein nitrogen using two-tenths of a cubic centimeter of blood.** C. M. WILHELMJ. *J. Lab. Clin. Med.* 7, 622-6 (1922).—Draw 0.2 cc. blood in a blood pipet, discharge into tube contg. powd. (COOK)<sub>2</sub>, rinse pipet twice with distd. H<sub>2</sub>O, and make the dild. blood up to 2.5 cc. with 5% CCl<sub>3</sub>COOH. Let stand 20 min. and filter. Transfer 1 cc. to a digestion tube, add 2 cc. of digestion mixt., and boil,

continuing for about 2 min. after the mixt. becomes a clear, pale green. The compn. of the digestion mixt. is 1.5 cc. 10%  $\text{CuSO}_4$ , 15 cc. distd.  $\text{H}_2\text{O}$ , 15 cc. concd.  $\text{H}_2\text{SO}_4$ , and 1.5 g.  $\text{K}_2\text{SO}_4$ . Add distd.  $\text{H}_2\text{O}$  to the cooled tube, and transfer contents to an aeration app., making up with rinsings to not more than 8–10 cc. Add 2 pieces of stick NaOH about  $\frac{1}{4}$  in. long. Draw a current of air through 5 cc. concd.  $\text{H}_2\text{SO}_4$  into the alk. mixt., sucking the liberated  $\text{NH}_3$  into 5 cc. 0.01  $N$  HCl. When the aeration is complete add 1 cc. Nessler-Winkel soln. dild. with an equal vol.  $\text{H}_2\text{O}$  to the tube, which should be graduated, and make up to 8 cc. with distd.  $\text{H}_2\text{O}$ . Compare the color developed with a standard prepd. by dissolving 0.764 g.  $\text{NH}_4\text{Cl}$  in 1 l. distd.  $\text{H}_2\text{O}$ , 1 cc. of which contains 0.2 mg. N. Use a Kober or Bock-Benedict colorimeter. E. R. LONG

**The titration of culture media.** L. MICHAELIS. *Z. Immunitäts.* 32, 194–203 (1921).—Use is made of *m*-nitrophenol in 0.3% concn. for detg. the H-ion concn. of culture media of reaction between  $p_{\text{H}}$  6.6 and 8.7. A wooden block comparator is used in which compensation is made for the color of the broth by placing a tube of uninoculated broth back of the colored standards. Autoclaving ordinary broth does not change the H-ion concn. Dilg. broth with salt soln. does not change the H-ion concn., as the peptone and phosphates of the broth make it a buffer soln. E. R. LONG

**The isolation of nucleic acid from tissues.** WALTER JONES AND CASPAR FOLKOFF. *Bull. Johns Hopkins Hosp.* 33, 443–4 (1922).—The following method can be applied to the isolation of nucleic acid of plant origin but cannot be used for animal glands; its successful application in a particular case would suggest that the questionable material under examn. is of plant origin. Dil. 5 l. of fresh brewer's yeast with 8 l. of cold tap  $\text{H}_2\text{O}$  and treat with 2.5 l. of 20% NaOH in small portions. Stir the mixt. continually for 10 min., taking care that the temp. does not rise. Nearly neutralize with HCl. Make faintly but distinctly acid to litmus with AcOH and allow to stand overnight in a cool place. Decant the muddy dark brown fluid and treat with HCl and alc. in the usual way for the pptn. of the nucleic acid. Wash by decantation with alc. of increasing strength and finally filter on a Buchner funnel. Grind the crude acid in a mortar with 5–6 parts of  $\text{H}_2\text{O}$  contg. an excess of  $\text{NH}_4\text{OH}$  and, after the soln. of the nucleic acid is complete, add an equal vol. of alc. Carefully neutralize the excess of  $\text{NH}_4\text{OH}$  with AcOH. This is the crux of the method; the excess of  $\text{NH}_4\text{OH}$  must not be neutralized until after the alc. has been added. Det. the end point by the appearance of a bulky dark brown ppt. which leaves the liquid transparent and nearly as colorless as distd.  $\text{H}_2\text{O}$ . Filter, and treat the filtrate with an equal vol. of alc. Wash and dry the pptd. snow-white flakes with alc. This process of purification does not involve any appreciable loss so that it may be repeated as often as is suggested by the appearance of the final material and may be applied to the purification of the com. preps. of yeast nucleic acid. Yield: 30 g. from 5 l. of yeast. The product is the  $\text{AcONH}_4$  addition product of yeast nucleic acid which dissolves completely and easily in  $\text{H}_2\text{O}$  to form a colorless soln. A. P. LOTHROP

**Quantitative studies with arsphenamine. I. A colorimetric method for the estimation of arsphenamine in blood and tissues.** A. C. KOLLS AND J. B. YOUNG. *Bull. Johns Hopkins Hosp.* 34, 149–51 (1923).—The method is based on the diazotization of the amino groups of arsphenamine and the coupling of the diazotized product with orcin producing a bright red color. **Whole blood.**—Measure 1 cc. of oxalated blood into a 10 cc. volumetric flask or calibrated test-tube and add about 3 cc. of distd.  $\text{H}_2\text{O}$ . Add 0.5 cc. each of 0.1  $N$  HCl and of freshly prepd. 1%  $\text{NaNO}_2$  soln., taking care that the solns. are kept cold. Add 1 cc. of 20%  $\text{CCl}_3\text{CO}_2\text{H}$  and 1–2 cc. of MeOH. Make up to 10 cc., mix thoroughly and, after a few min., filter. Measure 5 cc. of the clear filtrate into another flask or calibrated tube. If the filtrate contains even a trace of hemoglobin, it must be discarded. Add 2 cc. of 0.25  $N$  NaOH and 0.5 cc. of 0.05% orcin soln. in the order named. Make up to vol. after 10 min. and compare with suitable standards made up in normal blood and treated at the same time. **Tissues.**—Cut up 5 g. samples of the various organs with scissors and place in a mortar. Add an amt. of washed sand which has previously been found to displace 1 cc. of  $\text{H}_2\text{O}$ . Grind to a pulp. Transfer to an accurate 25 cc. measuring cylinder by means of a few cc. of  $\text{H}_2\text{O}$ . Rinse the mortar and pestle several times with  $\text{H}_2\text{O}$  but keep the vol. below 15 cc. Add 1 cc. of 10% HCl and 1 cc. of 2%  $\text{NaNO}_2$ . Shake and after 2–3 min. add 3 cc. of 20%  $\text{CCl}_3\text{CO}_2\text{H}$  and 2 cc. of MeOH. Make up to 25 cc. and filter after a few min. Measure 12 cc. of the filtrate ( $\frac{1}{2}$ , since 1 cc. was made up by the sand) in a measuring cylinder and make alk. with 0.25  $N$  NaOH. Add 1 cc. of 0.05% orcin and make up to 20 cc. It is advisable to det. the amt. of alkali necessary on the unused portion of the filtrate since the amt. cannot be definitely stated for various organs and conditions. Control the standards made in aq. soln. with standards made with finely divided normal

tissues to have a check on the activity of the reagents and on the yield after pptn. of the proteins. *Spinal fluid and blood plasma*.—If totally free from hemoglobin or red cells, both these fluids can be treated without the use of a protein precipitant. Large amts. of these fluids can be used which is a most desirable thing with spinal fluid which rarely contains more than a trace of arsphenamine. *Urine*.—Small amts. give more accurate results than large on account of the urinary pigment, which, despite the fact that the standard may have been made up with an equal amt. of normal urine, makes accurate approximation exceedingly difficult.

A. P. LOTHROP

**Preparation and comparison of standards for the estimation of creatine and creatinine.** GRAHAM EDGAR. *J. Biol. Chem.* 56, 1-6(1923).—Creatinine- $\text{ZnCl}_2$  or picrate are both satisfactory standards and the selection of one or the other is largely a matter of choice; the fact that any colorimeter, any depth of layer, and many concns. of standard soln. may be employed would appear to justify their more universal adoption, particularly since they may both be easily prepd. from com. creatine. *Prepn. of creatinine- $\text{ZnCl}_2$* .—Grind com. creatine in a mortar with an equal wt. of anhyd.  $\text{ZnCl}_2$ . Place the mixt. in a casserole and heat over a small flame or on a sand bath, with const. stirring, to 120-30°, when the mixt. will become a viscous mass (depending on the rate of heating and the moisture which may have been absorbed). Heat until the mass suddenly solidifies to a perfectly dry residue. If a crude product only is desired, leach the mass with a little cold  $\text{H}_2\text{O}$  or aq. alc. to dissolve out the excess of  $\text{ZnCl}_2$ . If a pure product is desired dissolve the residue in about 10 times its wt. of boiling 25%  $\text{AcOH}$  and add 2 vols. of alc. On cooling cryst. creatinine- $\text{ZnCl}_2$  separates in practically quant. yield and of a purity comparable with the best product obtained by repeated crystn. To prepare a standard contg. 1 mg. of creatinine per cc., dissolve 1.602 g. of the  $\text{ZnCl}_2$  salt in 1 l. of 0.1 *N*  $\text{HCl}$ . *Prepn. of creatinine picrate*.—Dissolve com. creatine in an excess of 6 *N*  $\text{HCl}$  and evap. to dryness on a water bath. Dissolve the creatinine- $\text{HCl}$  in a little  $\text{H}_2\text{O}$  and add a slight excess of pure picric acid dissolved in either boiling  $\text{H}_2\text{O}$  or boiling alc. Cool the mixt., filter off the pptd. creatinine picrate and wash it with a little cold  $\text{H}_2\text{O}$ . Recrystallize once from boiling  $\text{H}_2\text{O}$ , wash with alc. and dry at 100°. M. p. 205° (uncor.). On account of its limited soly. dissolve 1.5119 g. per l. to give a standard contg. 0.5 mg. per cc.

A. P. LOTHROP

**The preparation of tryptophan from the products of hydrolysis of lactalbumin with baryta.** H. C. WATERMAN. *J. Biol. Chem.* 56, 75-7(1923).—Prep. lactalbumin by coagulation of the filtrate remaining after prepn. of casein by Clark's method in the presence of a very small amt. of  $\text{HCl}$ . Treat 200 g. of the dry lactalbumin with a soln. of 700 g. of recrystd.  $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$  in 4 l. of distd.  $\text{H}_2\text{O}$ . Heat on a steam bath at about 85° for 40 hrs. Discard any undissolved material. Remove the  $\text{Ba}(\text{OH})_2$  from the filtrate with  $\text{H}_2\text{SO}_4$  and add enough more  $\text{H}_2\text{SO}_4$  to give a concn. of 7%. To the filtrate and washings which amts. to about 8½ l. add 1 l. of 10%  $\text{HgSO}_4$  in 5%  $\text{H}_2\text{SO}_4$ . Allow to stand for 3 days. Filter by suction in a cup filter of hardened paper in a small Buchner funnel and wash 15-20 times with 5%  $\text{H}_2\text{SO}_4$ , thoroughly stirring up the ppt. and crushing all lumps. The washing should be continued until tyrosine cannot be detected in the filtrate. Place the ppt. in 5%  $\text{H}_2\text{SO}_4$ , grind to a fine suspension and sat. with  $\text{H}_2\text{S}$ . Filter, grind in a mortar with a fresh amt. of 5%  $\text{H}_2\text{SO}_4$  and again treat with  $\text{H}_2\text{S}$ . Repeat until the filtrate no longer gives the color reaction for tryptophan. Add alc. in small amts. to the  $\text{H}_2\text{SO}_4$  soln. of tryptophan to prevent darkening of the soln. Remove the  $\text{H}_2\text{SO}_4$  quant. with  $\text{Ba}(\text{OH})_2$  and wash the  $\text{BaSO}_4$  with hot  $\text{H}_2\text{O}$  contg. a little alc. until no more tryptophan is removed. Conc. the filtrate and washings under diminished pressure with frequent addns. of alc. until crystn. begins. Conc. further under ordinary pressure. Remove the crystd. tryptophan. Treat the mother liquor and the filtrates from the recrystn. of the crude product with a 35% soln. of  $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$  at the temp. of a steam bath for 48 hrs. Remove the  $\text{Ba}$  quant. and crystallize the tryptophan as described above. A further small crop of crystals may be obtained by treating the filtrate with baryta and heating for 60 hrs. Total yield of purified product is 2.64 g. or 1.45% on the basis of ash and  $\text{H}_2\text{O}$ -free lactalbumin.

A. P. LOTHROP

**A quantitative method for the determination of phenols in blood.** N. W. RAKE-STRAW. *J. Biol. Chem.* 56, 109-24(1923).—Ppt. the proteins as usual with  $\text{H}_2\text{WO}_4$  according to the method of Folin and Wu. To 25 cc. of the filtrate add 1 cc. each of 2.5%  $\text{ZnCl}_2$  and 10%  $\text{Na}_2\text{CO}_3$ , stir and allow to stand for 1 hr. Centrifuge to remove the ppt. in which uric acid may be detd., if desired, according to the method of Morris and Macleod (*C. A.* 16, 1103); or filter if uric acid is not to be detd. To 10 cc. of the filtrate add 0.5 cc. of the dild. phenol reagent and 2 cc. of 20%  $\text{Na}_2\text{CO}_3$ . Mix and allow to stand for 30 secs. for destruction of excess reagent. Add 1 cc. of 5%  $\text{NaCN}$  and im-

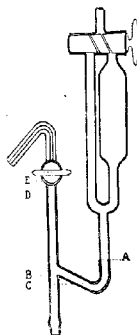
merse in boiling  $H_2O$  for  $1\frac{1}{2}$  min. Cool in running  $H_2O$  for at least 3 min. and compare against a standard phenol soln. contg. 0.025 to 0.030 mg. of phenol in 10 cc. which has been subjected to the same procedure as the unknown. For detns. in *plasma* use 8 vols. of  $H_2O$  and  $\frac{1}{2}$  vol. of  $Na_2WO_4$  and  $\frac{1}{2}$  N  $H_2SO_4$ ; for *corpuscles* use 5 vols. of  $H_2O$  and 2 vols. of each of the reagents. *Total (free plus conjugated) phenols*.—To 10 cc. of the filtrate in a test-tube add 0.25 cc. of concd. HCl. Close the tube with a piece of rubber tubing (previously boiled in dil. acid and then  $H_2O$ ) and a clamp-screw and heat in boiling  $H_2O$  for 10 min. Cool. To 10 cc. of the standard soln. add the same amt. of HCl. To both the unknown and standard add 0.5 cc. of 20% NaOH, mix and proceed as in the detn. of free phenol. The difference between total and free represents conjugated phenol. *Reagents*.—*Phenol reagent*.—Gently reflux for 2 hrs. with 750 cc. of  $H_2O$ , 100 g.  $Na_2WO_4$ , 20 g. phosphomolybdic acid, 50 cc. 85%  $H_3PO_4$  and 100 cc. concd. HCl and make up to 1 l.; dil. a portion with 3 vols. of  $H_2O$  before using. *Standard phenol soln.*—Dissolve 5 g. of pure phenol in 1 l. of  $H_2O$  and add 4–5 drops of concd. HCl; this soln. will keep for several weeks and 10 cc. dild. to 500 cc. affords a soln. which keeps for several days and from which the dil. standard is prepd. by dilg. 25 cc. to 1 l. Standardize the original soln. as follows: to 10 cc. add 6 cc. of approx. N NaOH. Warm to  $65^\circ$  and add slowly a measured excess (40–50 cc.) of N I soln. When pptn. of the iodophenol is complete, cool the soln., acidify with dil.  $H_2SO_4$  and make up to 250 cc. Filter and det. the excess I in an aliquot (100 cc.) of the filtrate by titration with standard  $Na_2S_2O_3$  soln. Calc. the I combined with the phenol and multiply by 0.1235 to det. the amt. of phenol in 10 cc. *NaCN soln.*—To 100 cc. of 5% NaCN soln. add 3–4 drops of concd.  $NH_4OH$  and keep the soln. in a bottle stoppered with a cotton plug.

A. P. LOTHROP  
*J. Biol. Chem.* 56,

**A trap for the Van Slyke gas analysis apparatus.** A. T. SHOML. 125–6(1923).—The trap is needed because it is difficult to obtain correct detns. when an app. is newly set up or is taken apart and cleaned because of the gradual dislodging of air held along the sides of the glass and rubber tubing. The trap is sealed to the app. at A. Any gas or fluid is trapped in D and can be removed by the stopcock E. B should be sharp and in a higher horizontal plane than C. The trap can be attached to the fine bore app. or the const. vol. app. and can be used with a mech. shaker.

A. P. LOTHROP

**Studies in narcosis. I. Ether analysis.** T. R. KRUSE. *J. Biol. Chem.* 56, 127–37(1923).—The principle of the method depends upon the absorption of  $Et_2O$  by concd.  $H_2SO_4$  by which absorption occurs quickly and completely and the procedure in no way interferes with a subsequent analysis of  $CO_2$  and  $O_2$ . The Guthrie analyzer (*C. A.* 16, 265) is provided with two additional absorbers contg. concd.  $H_2SO_4$  and concd.  $CaCl_2$  soln. is used as a displacing liquid. **II. A method for the determination of the respiratory exchange during ether narcosis.** *Ibid.* 139–55.—In spirometers of 75–100 l. capacity, so constructed that the  $H_2O$  is confined to a sealing space, loss by soly. is slight after the initial change has occurred and non-uniformity due to stratification can be obviated by the use of a suitable mixing device. The originals must be consulted for the details of both of the methods. In expts. performed on dogs under varying degrees of  $Et_2O$  anesthesia extending over many hrs. it is found that in moderate to deep anesthesia the  $O_2$  consumption and  $CO_2$  elimination gave a fairly const. reduction curve dependent more upon duration of anesthesia than upon precise conditions. Light anesthesia gives a similar curve but at a higher level. The sums of the actual  $O_2$  and  $CO_2$  percents in deep narcosis may be as low as 19.93 and as high as 21.6 after the  $Et_2O$  is removed.  $CO_2$  elimination is depressed more than  $O_2$  consumption in deep narcosis and the reverse is true after removal of the  $Et_2O$ . The respiratory quotients accordingly decrease but may increase in the terminal stage of deep anesthesia. In light anesthesia the  $O_2$  consumption exceeds the  $CO_2$  elimination provided the animal has not been previously satd. with  $Et_2O$ . Animals in a state of reduction require much less anesthetic as the reduction increases. For equal duration of narcosis, the depression of metabolism is associated with the intensity of the narcosis. Removal of  $Et_2O$  markedly augments the respiratory exchange but such increases become progressively less with the length of the narcosis.



A. P. LOTHROP

**Determination of amino nitrogen in compounds reacting slowly with nitrous acid.** D. W. WILSON. *J. Biol. Chem.* 56, 183–90(1923).—“Detns. of amino groups reacting slowly with  $HNO_2$  were carried out by the use of Van Slyke’s method, using the micro

app. The rates of reaction were detd. at 21–26° over periods of from 3 min. to 5 hrs., shaking only the last 1–2 min. Guanine, guanosine, and guanylic acid yield in 1–2 hrs. amts. of gas varying from 8 to 27% above the theoretical for 1 reacting N. Adenine and adenine nucleotide both yield the theoretical amt. of N in 1–2 hrs. Xanthine and hypoxanthine produce traces of gas but uric acid does not. Cytosine yields 37% more than the quantity of gas produced by 1 reacting N. Thymine, uracil, and uridine do not react with  $\text{HNO}_3$ . Two atoms of N in allantoin react slowly and continuously, but the reaction is not complete in 5 hrs. One atom of N in creatinine reacts with  $\text{HNO}_3$  in 1 hr. The presence of creatinine may account for  $\frac{1}{3}$  of the blank in the detn. of the amino N by Van Slyke's method. The rates of the reactions are greatly influenced by the temp. In detns. of long duration it is absolutely essential that the stopcocks be well ground and thoroughly greased with heavy stopcock grease (after every 3–4 detns.). The determination of free amino nitrogen in protein. *Ibid* 191–201.—The methods of Van Slyke and of Sørensen for the detns. of free amino groups, using solns. of native and derived proteins, were compared. The Van Slyke method may yield high results due to hydrolysis or low results due to pptn. of the protein by  $\text{HNO}_3$ . Sørensen's method is less susceptible to error as no ppt. is formed and the titration can be carried out without difficulty even with colored solns. There is a continuous increase in values as the period of reaction is lengthened in the Van Slyke method and no single period of reaction yields results with all of the preps. similar to those obtained by Sørensen's method.

A. P. LOTHROP

Colorimetric estimation of hydrogen-ion concentration in culture media. G. ABT. *Cuir* 12, 104–117(1923).—A review.

H. B. MERRILL

The standardization of hemoglobinometers and its importance for index calculation. H. C. GRAM. *Acta Med. Scand.* 57, 27–40(1922).—The Haldane ferricyanide method gives too low O values even in the hands of experts; the safest way of detg. the O capacity is considered the air-gas-pump method in its older form or in Van Slyke's modification. When this is done by a reliable procedure 18.5% O corresponds to about a normal red cell count of 5,000,000 per cc., and this gives 100% hemoglobin corresponding to a color index of 1. The following formula is offered for the calcn. of the color index:  $I = \% \text{Hb}/E \times 20$ , where  $E$  is the red cell count.

S. MORGULIS

A self-registering respiration apparatus for the determination of the absorption of oxygen and the caloric exchange in man. AUGUST KROGH. *Compt. rend. soc. biol.* 87, 458–60(1922).—The app. consists of a 6 l. spirometer whose excursions are registered on a kymograph moving at a const. rate of 20 min. per min. The spirometer contains a special receptacle with 8 kg. of NaOH which is sufficient to absorb 1000 l. of  $\text{CO}_2$ . The spirometer is filled through a stopcock with  $\text{O}_2$  from a tank; it is then connected with the subject who breathes through a mask. The expired air passes through the alkali before it enters the spirometer. As the  $\text{O}_2$  is being used up the spirometer registers a descending curve of the kymograph. The drop between 2 vertical lines sepd. by a space representing 10 min. marks directly the amount of O consumed under standard conditions. By adjusting the diet for the 2 previous days it is possible to realize a fairly const. caloric value of 4.9 cal. per l. of  $\text{O}_2$ .

S. MORGULIS

Method for determining the total fatty acids and unsaponifiable matter in the tissues and fluids of the organism. P. LEMELAND. *Compt. rend. soc. biol.* 87, 500–1(1922).—The tissue or blood is extd. with 95% alc. in a Kumagawa-Suto app. for 8 hrs. The exts. are evapd. under reduced pressure. The residue is sapond. 2 hrs. under a reflux with 25 cc. 2 Nalc. KOH., this is then added to 28 cc.  $\text{H}_2\text{O}$ , 28 cc. 95% alc. and 44 cc. N HCl. This is boiled again 15 min. under reflux. The fluid is decanted while the undissolved material is extd. 3 times with petroleum ether (250 cc. b. 50–60°), which removes all unsaponifiable matter; this is evapd. and the cholesterol sepd. from it. The alc. soln. of K soaps is dild. with 2 vols. of  $\text{H}_2\text{O}$ , acidified with HCl, and extd. 4 times with 100 cc. of petroleum ether. The ext. is boiled off quickly at 20 mm. Hg and the dry residue again dissolved in petroleum ether (b. 40–50°). The soln. is put into a weighed flask, the ether driven off at 50° and the fatty acids are weighed. L. states that the results obtained by this procedure are better than those by the original Kumagawa-Suto method.

S. MORGULIS

The determination of methylene blue circulating in the blood. E. SCHULMANN AND L. JUSTIN-BESANCON. *Compt. rend. soc. biol.* 87, 519–20(1922).—Method: 60 to 100 cc. blood is allowed to coagulate and the serum (20 cc.) is treated with 8 cc. of a 40%  $\text{CCl}_3\text{COOH}$ ; after shaking it well the ppt. is allowed to settle for 3 min. and is then filtered off. 14 cc. of the colorless filtrate is boiled for 30 sec., when the color appears; the soln. is then evapd. until the vol. is just 7 cc. The color is matched against that of a standard methylene blue soln. The expts. show that after an injection of a 5%

soln. (giving 5 mg. per kg.) methylene blue appears in the blood almost at once, the curve rapidly rising and falling. Following the ingestion of the substance (0.25 g. per day) the color develops slowly and disappears also gradually. After a continued ingestion there is an accumulation of methylene blue in the blood so that an injection produces a very striking rise in blood content, up to 0.0009 mg. per kg. of blood.

S. MORGULIS

**A micro-method for the determination of urea in plasma, lymph and cerebrospinal fluid.** MAURICE NICLOUX AND GEORGES WELTER. *Compt. rend. soc. biol.* **87**, 584-5 (1922).—The authors apply Fosse's reaction of the pptn. of urea with xanthidrol as the insol. dioxanthylurea for the estn. of urea in biol. fluids. The details of this method have been described in a previous paper (*C. A.* **16**, 1444).

S. MORGULIS

**Mercuric cyanide as an agent for preserving the blood urea.** GEORGES FONTÈS AND GEORGES WELTER. *Compt. rend. soc. biol.* **87**, 586-8 (1922).—The authors utilize Colombier's discovery that  $\text{Hg}(\text{CN})_2$  is the best antiseptic for preserving unchanged the urea in urines to prevent the disappearance of this substance from blood samples which could not be at once analyzed. They found that with the Nicloux and Welter xanthidrol gravimetric method (cf. *C. A.* **16**, 1794) the addn. of 0.1 mg. of  $\text{Hg}(\text{CN})_2$  per cc. of the blood did not affect the detn. They combine the proper proportions of the cyanide with the K oxalate. Bloods preserved by this method gave unchanged results for urea even after a month's time.

S. MORGULIS

**Determination of creatinine in blood.** E. MORHAU. *Compt. rend. soc. biol.* **88**, 249-51 (1923).—The method described is apparently not as simple or accurate as the one commonly used.

S. MORGULIS

**A new reaction for free tryptophan.** P. DANILU. *Compt. rend. soc. biol.* **88**, 278-80 (1923).—An aq. soln. of tryptophan sets free I from a soln. of HI when heated. For the test 0.1 cc. of a HI soln. 1:250 parts of  $\text{H}_2\text{O}$  is used, and 0.1 cc. of a soln. of tryptophan in  $\text{H}_2\text{O}$  1:200 to 1:50,000. The reaction takes place at boiling temp. of the water bath.

S. MORGULIS

**Determination of calcium in blood plasma.** A. HIRTH. *Compt. rend. soc. biol.* **88**, 458-60 (1923).—The method involves incineration of the plasms, dissolution of the residue in HCl, removal of  $\text{P}_2\text{O}_5$  and Fe and pptn. of the Ca as oxalate. The  $\text{CaC}_2\text{O}_4$  is incinerated, dissolved in HCl and titrated with NaOH.

S. MORGULIS

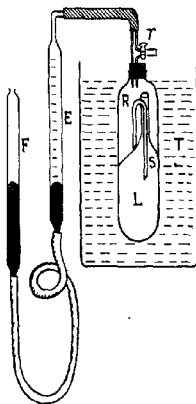
**Determination of magnesium in blood plasma.** A. HIRTH. *Compt. rend. soc. biol.* **88**, 460-1 (1923).—The filtrate from the Ca detn. (cf. preceding abstr.) is cvapd.,  $\text{NH}_3$  fumes are driven off, the residue is dissolved in HCl, neutralized with  $\text{NH}_4\text{OH}$ , evapd. to small vol. and the Mg is pptd. with ammonium phosphate and  $\text{NH}_4\text{OH}$ . After standing, the ppt. is washed with  $\text{NH}_4\text{OH}$  soln. and dissolved in dil.  $\text{HNO}_3$  contg.  $\text{H}_2\text{SO}_4$ . The Mg is then pptd. with ammonium phosphomolybdate, collected on a filter and washed with  $\text{NH}_4\text{NO}_3$ . The phosphomolybdate is removed as the Ba salt, and weighed as such after appropriate treatment.

S. MORGULIS

**Determination of substances which set free a gas in reacting with certain reagents.** G. P. PAMFIL. *Compt. rend. soc. biol.* **88**, 924-5 (1923).—When a substance in reacting with another substance yields a gas as a product of the reaction, the quantity of the gas may be utilized in calg. the amt. of the substance examd. The substance to be analyzed is placed in L and the appropriate reagent in the chamber R. The app. used for the reaction is immersed in a water bath and is connected through a capillary tube with the usual gas-measuring outfit FE. When the temp. is equalized the stopcock is closed and by lowering the leveling bulb F a partial vacuum is established in the system which causes the reagent from R to be siphoned over into the compartment L. When the temp. has again become equalized the amt. of gas evolved in the reaction is detd. directly by bringing the Hg level to the same point in F and E.

S. M.

**Methods for the determination of the ammonia in the blood.** A. BISGAARD AND JOH. NOERLVIG. *Compt. rend. soc. biol.* **88**, 813-5 (1923).—The authors repeated their earlier analyses on the  $\text{NH}_3$  content of blood of epileptics taken during the interval between attacks and just previous to a crisis, using alc. which has carefully been purified



to remove N impurities. They found again that the blood  $\text{NH}_3$  varied from 0 to 0.28 mg. per 100 cc., but increased considerably before an attack. Commenting on Nash and Benedict's detns., which give only 0.1 mg. per 100 cc., they repeated these analyses according to the N. and B. technic and came to the conclusion that their low values are due to the fact that the aeration for 10 min. is not sufficient to remove all the  $\text{NH}_3$  present. By aerating for about 3 hrs. the amt. increased to 0.2-0.3 mg.

S. MORGULIS

**Further notes on the staining reactions of fat and lipins in tissue sections.** J. L. SMITH AND THEODORE RETTIE. *J. Path. Bact.* 25, 403-5(1922); cf. *C. A.* 16, 1444.—A 10% aq. soln. of AcH has little or no action on fat, but the addition of NaOAc makes it active. The probable explanation is, that aldol condensation takes place making the AcH capable of attaching itself to the fat mol. If the condensation be carried out with strong HCl at low temps. most of the AcH is polymerized to paraldehyde, but a small amt. of soln. is obtained which reacts very readily with all fats and lipins. These different solns. have a distinctive action on fats of different origin, which has not been well worked out yet.

JOHN T. MYERS

**Bang's micro-method for the determination of blood and serum chlorides.** HERBERT SCHOENFELD. *Biochem. Z.* 134, 528-32(1923).—The original method gives sufficiently accurate results. Prigge's suggested improvements (cf. *C. A.* 16, 4227) are unnecessary.

GEORGE ERIC SIMPSON

**Urobilin determination in feces.** A. ADLER AND E. SCHUBERT. *Biochem. Z.* 134, 533-40(1923).—For the method see *C. A.* 17, 1258. From the amt. of urobilin in the 1st alc. ext.,  $e_1$ , the total amt.  $s$  may be calc'd.:  $e_1/[1/(1-q)] = s$ . When  $e_1 = 1/3000$  to  $1/15000$ ,  $q = 1/2$ ; when  $e_1 < 1/3000$ ,  $q = 0.45$ ; when  $e_1 > 1/15000$ ,  $q = 0.57$ . This follows because successive extns. plotted, fall into a logarithmic curve:  $\log e_1 - \log e_n = (n-1)K$ , where  $n$  = the no. of the extn. and  $e$  is the reciprocal of the diln.

GEORGE ERIC SIMPSON

**Hemocarbamidometer: An apparatus for the determination of urea in small amounts of blood serum.** ZOLTAN ASZÓDI. *Biochem. Z.* 134, 546-52(1923); cf. *C. A.* 16, 2156.—The Partos method is applied to the detn. of urea in blood; 1 to 2 cc. of which are required for a detn.

GEORGE ERIC SIMPSON

**Blood sugar estimation.** H. BORUTTAU. *Med. Klin.* 19, 466(1923).—Comparative blood sugars estns. were made by the Fehling, Bang, and micro-Pavy (Weiss) methods. As a rule the Fehling detns. were higher; the Bang and micro-Pavy detns. agreed very closely.

G. H. S.

**Alizarin feeding as a biological method.** ADOLF BAUER. *Z. anat. Entwicklungs-ges.* 66, 589-91(1922).—Laying hens were fed abundantly with alizarin, as were also young dogs whose legs had been fractured. The coloring of the egg shells was unchanged but the regenerating bony tissues stained deeply, indicating actively functioning cells in the injured areas.

G. H. S.

**Isotonic solutions.** WM. A. KNIGHT. *Chemist & Druggist* 98, 59(1923).—Solns. used for the eye should be isotonic with the tears, i. e., equiv. to 1.4% NaCl soln., f.p.  $-0.85^\circ$ . Where NaCl is incompatible, the isotonic equiv. of other salts should be used, e. g.,  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  (A) with  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  (B), or  $\text{KNO}_3$  with  $\text{AgNO}_3$ . To render 1 l. of 0.2% soln. of B isotonic with the tears by adding A, calc. from the isotonic coeff. of De Vries (B:NaCl = 2:3; A:NaCl = 4:3) the amt. of NaCl equiv. to 2 g. of B, i. e.,  $2 \times \frac{2}{3} \times 58.5/287.5 = 0.27$  g. NaCl. Then,  $14 - 0.27 = 13.73$  g. NaCl is the equiv. of the amt. of A to be used, i. e.,  $13.73 \times \frac{1}{4} \times 322/58.5 = 56.68$  g. A. Hence dissolve 2 g. of B and 56.68 g. of A in 1 l. to obtain the desired isotonic soln. Similarly, solns. for hypodermic injection should have the osmotic equiv. of 0.9% NaCl soln.

S. WALDBOTT

**Methods of determining some nitrogenous substances in urine.** H. HORTZ. *Schweiz. Apoth. Ztg.* 61, 77-84, 95-101(1923).—The methods described are not new.

S. WALDBOTT

**Determination of chlorides in blood serum by means of the refractometer.** F. URZ. *Schweiz. Apoth. Ztg.* 61, 193-5(1923).—The process of J. Becka (*C. A.* 17, 699) is applied to blood serum. Remove albumin with  $\text{UO}_2(\text{AcO})_2$  and dil. with  $\text{H}_2\text{O}$  to 4 vols. To 9.9 cc. of this dild. serum add 0.1 cc. concd.  $\text{HNO}_3$  and det.  $n^{17.5}$ . Also det.  $n$  of the 0.1 N  $\text{AgNO}_3$ . Then mix 10 cc. of the acid serum with 5 cc. of 0.1 N  $\text{AgNO}_3$ , shake and set aside. Pour off the clear soln. and det.  $n^{17.5}$ . From the 3 values calc. NaCl according to Becka's formula. This method is rapid and accurate, showing 0.61 g. NaCl per 100 cc., while Volhard's method gave 0.608 g.

S. WALDBOTT

**Detection of benzene in cadavers.** A. O. GERTLER. *J. Pharmacol.* 21, 161-4(1923).— $\text{C}_6\text{H}_6$  was removed from ground tissue by adding an equiv. wt. of slightly

acidified  $\text{H}_2\text{O}(\text{H}_2\text{SO}_4)$  and distg. with steam, the distillate being passed through cold  $\text{CCl}_4$ . The  $\text{CCl}_4$  was treated with  $\text{HNO}_3$ - $\text{H}_2\text{SO}_4$  and the  $\text{C}_6\text{H}_4(\text{NO}_2)_2$  formed recovered by evapn. of the  $\text{CCl}_4$ , extd. with  $\text{Et}_2\text{O}$  and identified by the color reaction with fructose, reduction to  $\text{C}_6\text{H}_4(\text{NH}_2)_2$ , etc. A case of death by  $\text{C}_6\text{H}_4$  poisoning showed the following tissue content ( $\text{C}_6\text{H}_4$  per 100 g. tissue): brain, 19.2; liver, 10.1; lung, 9; blood, 6.4; heart, 2.4; fat and spleen, traces; kidney, stomach and intestinal contents, absent. 68 normal tissues gave a negative test for  $\text{C}_6\text{H}_4$ . A correction of 0.8 mg. (material extd. by  $\text{Et}_2\text{O}$  from normal tissue) should be applied to the wt. of  $\text{C}_6\text{H}_4(\text{NO}_2)_2$  isolated. C. J. WESS

A new apparatus for the quantitative absorption of gases, particularly carbon dioxide of respiration (DAMIANOVICH) 1. Combined colorimeter nephelometer (U. S. pat. 1,458,964) 1.

### C—BACTERIOLOGY

A. K. BALLS

**Studies of infant feeding. XVII. A bacterio-chemical study of the acid stools excreted by breast-fed and bottle-fed infants.** A. W. BOSWORTH, H. K. WILDER, M. E. BLANCHARD, E. W. BROWN, AND M. F. MCCANN. *Am. J. Diseases Children* 23, 323-37 (1922).—The feces of 24 hrs. are placed in a 500-cc. flask; this is filled to the mark with distd. water and 2 cc.  $\text{CHCl}_3$  is added. Of this, 400 cc. is taken for the detn. of the volatile acids, placed in a volumetric flask, neutralized by aid of phenolphthalein with 10%  $\text{NaOH}$  and made up to 500 cc. It is transferred to an Erlenmeyer flask of 1000 cc., heated on a water bath under reflux condenser with frequent shaking. It is cooled off, 1 cc.  $\text{CHCl}_3$  is added and left in ice box to solidify the soaps of the higher fatty acids. The soln. is filtered through cotton, then paper. Twenty drops 85%  $\text{H}_3\text{PO}_4$  is added and filtered again after standing 1 hour in the ice box. Of this filtrate 150 cc. are used for distn. in a current of steam, keeping the vol. of fluid about const. Each 100 cc. distillate is titrated with 0.1 *N* alkali and phenolphthalein until less than 0.2 cc. is required. Stools from normal healthy breast-fed babies are acid and contain acetic and formic acids. The stool from healthy bottle-fed infants, when acid, contains acetic acid. A number of microorganisms isolated from acid stool reduce citrate to a volatile acid. This may be acetic or a mixt. of acetic and formic acids. Some bacteria yield  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . Addn. of sol. citrates to modified milk increases only slightly the acetic acid contents of the stools; the addn. of insol. citrates gives a marked increase of acetic acid. A graphic method is given for the study of the nature of the volatile acids which may be distd. from infant's stools, based on the velocity of distn.

S. AMBERG

**The production of toxic substances by pneumococci.** A. M. CHESNEY AND A. B. HODGES. *Bull. Johns Hopkins Hosp.* 33, 425-8 (1922).—Filtrates of actively growing cultures of pneumococci in beef infusion broth, normal human serum, and defibrinated normal human blood are not toxic for mice when injected intraperitoneally. A sol. toxin is thus not present and the expts. cannot be said to throw any light on the complex problem of the cause of the intoxication in lobar pneumonia. A. P. LOTHROP

**Influenza-like bacilli.** Growth of influenza-like bacilli on mediums containing only an autoclave-labile substance as an accessory food factor. T. M. RIVERS. *Bull. Johns Hopkins Hosp.* 33, 429-31 (1922).—Two influenza-like bacilli are described which require only the heat-labile accessory food factor found in unautoclaved yeast ext. and which might easily be mistaken for true influenza or pertussis bacilli. *B. para-influenzae* or *Hemophilus para-influenzae* is suggested as the name for this group of organisms. A. P. LOTHROP

**Action of bacteria on minerals. Oxidation of blende.** ANDRÉ HELBKONNER AND W. RUDOLFS. *Compt. rend.* 174, 1378-80 (1922).—Mixts. of sterilized soil, pulverized blendes contg. 46% of Zn, and elementary S were inoculated with bacteria capable of attacking pptd. ZnS and were maintained at 28° and a state of humidity corresponding to about 60% of the water-holding capacity of the soil for 18 weeks. The mixts. were stirred frequently to insure aeration. The expt. was repeated with willemite, smithsonite and a silicate ore each contg. a small amt. of Zn, and also with mixts. of pulverized blende and galena. Under the most favorable conditions with soil 250 g., willemite 75, and inoculated S 10, 15.53% of the Zn was dissolved. The figure for willemite in the absence of S and not inoculated was 0.41%. The optimum conditions for the mineral low in Zn were the same as for willemite and 74.91% of the Zn present was dissolved. With smithsonite under the same conditions the figure was 22.67%. The bacteria of Lippmann produce  $\text{H}_2\text{SO}_4$  sufficient to dissolve  $\text{Zn}_2\text{SiO}_4$  and  $\text{ZnCO}_3$ . In mixts. of ZnS and PbS, ZnS is dissolved but not PbS. L. W. RIGGS



Researches made in Denmark upon the effect of soil conditions on bacterial life and the chemical transportations taking place in the soil (CHRISTENSEN) 15. Action of certain bacteria on the nitrogenous material of sewage (BIRGE) 14.

## D—BOTANY

B. M. DUGGAR

The formation of nodules by different varieties of soy beans. E. B. FRED AND O. C. BRYAN. *Soil Science* 14, 417-20(1922).—Both lab. and field tests indicate that the nodule bacteria of soy beans are not highly sp.; bacteria of one variety readily infect another. Variation in nodule formation under field conditions must be due to some other factor.

R. BRADFIELD

Manganese, moisture, ash and iron content of a number of roses grown in the same garden, and of the soil in which they grew. II. An observation on the relation between ash (or Mn) content and the dry matter of blossoms and seeds. D. H. WESTER. *Pharm. Weekblad* 60, 537-40(1923).—The blossoms of 30 varieties of roses grown under identical conditions showed a variation in Mn content between 2.4 and 8.79 mg. per 100 g. dry matter, or 46.36-145.52 mg. per 100 g. ash. This variation is much smaller than that between other species of plants, where the range was found to be 11.2-222.1 mg. per 100 g. ash. The Mn content of the soil was 10 mg. per 100 g. The accumulation of Mn in the blossom is therefore significant. The av. values (5% ash and 0.005% Mn) coincided with the av. values for the seeds of 48 and the blossoms of 34 other species examd. This is noteworthy in view of the fact that blossoms contain 8-9 times as much  $H_2O$  as do seeds.

A. W. DOX

Decomposition of wood as a biological problem. H. C. SCHELLENBERG. *Vierteljahrsschr. Naturforsch. Ges. Zurich* 65, 30-1(1920); *Abstracts Bact.* 6, 395.—The biological decompn. of wood is dependent on factors similar to those required by plants (air, moisture and temp.). Three stages of decompn. of the org. matter can be observed among the filamentous fungi: (a) rust and rot fungi decomposing only sugar, starch and dextrin; (b) *Penicillium* and *Mucor* attacking, in addn. to the above substances, also hemicelluloses, (c) Polyporeae, Agaricaceae and Ascomycetes dissolving the lining out of the membrane and attacking the true celluloses. The last group consists of semiparasites, wound parasites, destroyers of wood constructions, destroyers of wood in grasses and other plants. The course of decompn. is as follows: the fungi first assimilate the sugars, then the dextrins and gums, later the hemicelluloses, and finally the celluloses are acted upon. The phys. properties are changing at the same time. The formation of humus is in close connection with the decompn. of wood; the org. substance is decomposed by fungi; a mixed flora of bacteria and fungi then follows, finally a rich fauna of lower animals.

H. G.

Protein synthesis in *Chlorella*. W. C. MUENSCHER. *Bot. Gaz.* 75, 249-67(1923).—The nutrient soln. used contained N in the form either of  $Ca(NO_3)_2$  or  $(NH_4)_2SO_4$ . Cultures were grown in diffuse light and in the total absence of light for 105 or 235 days. Quant. detns. were made of the vol., dry wt., and total N content of the growth obtained. "The data obtained offer strong evidence indicating that *Chlorella* sp. can synthesize proteins in total darkness when N is supplied in inorg. combination." No evidence of free N fixation by *Chlorella* sp. was obtained.

BENJAMIN HARROW

Delayed germination and catalase activity in *Xanthium*. C. A. SHULL AND W. B. DAVIS. *Bot. Gaz.* 75, 268-81(1923).—The upper seeds of *Xanthium* show constantly less catalase activity per unit of dry substance than the lower seeds. The catalase activity is relatively stable in dry stored seeds, at least, for several months. Long-delayed germination leads first to increased catalase activity of upperseeds, followed by a decline.

BENJAMIN HARROW

Permeability of the cell to electrolytes. ORAN RABER. *Bot. Gaz.* 75, 298-307(1923).—The permeability of *Laminaria* has been studied. Neutral salt solns. of the same osmotic pressure and cond. as sea water cause an initial decrease in permeability, followed by an increase if the valency of the cation is greater than that of the anion. They cause an increase in the permeability from the start if the valency of the cation is greater than that of the anion. If the 2 are of the same valency the effect will depend upon the relative size of the ions and the density of the accompanying electric charges. A hypothesis is proposed to explain the observed phenomena.

BENJAMIN HARROW

Action of ultra-violet light on yeast-like fungi. II. F. W. TANNER AND EARL RYDER. *Bot. Gaz.* 75, 309-17(1923); cf. Feuer and T., *C. A.* 14, 2651.—No evidence was secured to show that yeast cells possess any marked resistance to ultra-violet light. They were able to live only from a few sec. to a few min. longer than bacteria.

B. HARROW

**Chemical investigation on the fruit of *Evodia rutaecarpa*, Benth. et Hook.** YASUHIKO ASAHINA *Acta Phytotchimica* 1, 67-89 (1923).—A summarized paper, in German, of the work of A. with Ishio, Kashiwagi, Mayeda, and Fujita, with some corrections. Cf. *C. A.* 10, 250, 607; 11, 332; 16, 1584. K. KASHIMA

**The chemical properties of *Derris elliptica* (Tuba root).** F. TATTERSFIELD AND W. A. ROACH. *Ann. Applied Biol.* 10, 1-17 (1923).—The 3 most important toxic constituents of the root are: "Tubatoxin," a white cryst. deriv. and a resin or series of resins identical with "derride" (Sillevaldt) and "tubain" (Wray). Two yellow cryst. derivs. and a liquid resin also were isolated. Tubatoxin, the yellow cryst. derivs. and the resins contain  $\text{CH}_2\text{O}$  groups and appear to be interrelated. Prolonged boiling and exposure to light convert tubatoxin into 3 yellow cryst. derivs. and a resin. Sillevaldt's "anhydroderride" may have been formed during the extn. process. 95% alc. exts. the root toxins along with other non-toxic derivs.  $\text{C}_6\text{H}_6$ , dry  $\text{Et}_2\text{O}$  and  $\text{CCl}_4$  are good solvents and have a selective action on the toxins. Petroleum derivs. are not good solvents. Evaluation of the root may be accomplished by extn. with dry  $\text{Et}_2\text{O}$  and detn. of the  $\text{CH}_2\text{O}$  content by the Zeisel method. Exts. varied between 7 and 22%; the  $\text{CH}_2\text{O}$  content between 13.5 and 14.7%. The amts. of non-toxic material varied widely. CHAS. H. RICHARDSON

**A quantitative study of the insecticidal properties of *Derris elliptica* (Tuba root).** J. C. F. FRYER, R. STENTON, F. TATTERSFIELD AND W. A. ROACH. *Ann. Applied Biol.* 10, 18-34 (1923).—The exts. are highly toxic to caterpillars, less so to aphids. "Tubatoxin" and a yellow resin (the derride of Sillevaldt) are the toxic principles; both are toxic to insects when finely dispersed in  $\text{H}_2\text{O}$ . The dry root may be powdered, worked up in  $\text{H}_2\text{O}$  with soap or other emulsifying agents and applied as an insecticide. The poisons of derris root are solids, slightly sol. in  $\text{H}_2\text{O}$ ; their toxicity appears to depend upon their degree of dispersion. A biol. method of detg. insecticidal properties is described. The results agree with the chem. method (detn. of  $\text{CH}_2\text{O}$  content). Tubatoxin and the resin, derride, have the same order of toxicity to certain caterpillars as nicotine. Cf. *C. A.* 13, 2723; 16, 2005. CHAS. H. RICHARDSON

**Comparative spectroscopic study of the green pigment of *Chetoptera* and of the chlorophyll of *Ulva*.** MARC ROMIEU AND FERNAND OBATON. *Compt. rend.* 175, 51-4 (1922).—The close similarity of the absorption spectra of these pigments in benzene soln. points to their common origin. "Chetopterin," a name proposed by Ray Lankester for the pigment in *Chetoptera*, is a pigmentary substance of extrinsic origin closely resembling the enterochlorophylls in its spectroscopic characters. L. W. RIGGS

**The transformation of urea in the ripening of the fructification of *Lycoperdon*.** N. N. IVANOV. *Biochem. Z.* 135, 1-20 (1923).—In the unripe fungus urea is variable in amt. and may be lacking. During ripening total solids decrease; total N, urea N, and amino N increase. In the spores urea is absent and amino N small. Since the urea is very difficultly extd. with alc., but easily with hot  $\text{H}_2\text{O}$ , it is in some labile union. The amino N compds. are the precursors of urea. Trehalose can be isolated from the unripe but not from the ripe fructification. The urea is formed in the course of intense oxidative processes during which carbohydrate is burned and N is stored. Urea is an intermediate substance and also a storage material. During ripening it is either synthesized into arginine or purine compds., or split up by urease, and the resultant  $\text{H}_2\text{O}$  and  $\text{NH}_3$  are utilized in the construction of plant tissue. GEORGE E. SIMPSON

**The origin of peroxidases in plants. The conditions which cause the splitting off of peroxidase from the protoplasts and its migration to the cell sap.** W. PALLADIN AND S. MANAKAJA. *Biochem. Z.* 135, 142-57 (1923).—The protoplasm and cell nuclei of growing and resting plant organs give characteristic color reactions for peroxidase. This is true of living plasmolyzed cells as well as of cells submitted to prolonged autolysis. The peroxidase reaction is exhibited by a variety of tissues. The cell wall of the epidermis of onion scales contains no peroxidase. In general the peroxidase reaction is destroyed by prolonged contact with alcohol. In the following expts. on the relation of salt solns. to autolysis, it was necessary 1st to remove any peroxidase which might be present in the cell sap, so that its occurrence in the tissue itself might be detd. The tissue was submitted to preliminary prepn.; it was finely cut up, expressed, washed with  $\text{H}_2\text{O}$ , expressed, and the resulting mass submitted to "preparatory autolysis" in  $\text{CHCl}_3$  water for 24 hrs. After again pressing out the mass, washing and repressing, it was submitted to 6-10 days autolysis in the soln. under investigation. Then the peroxidase was detd. with guaiac and  $\text{H}_2\text{O}_2$ . During cytalysis the peroxidase is released from the protoplasts to which it is bound. The amt. released varies with the salt, and with a given salt is proportional to salt concn. Autolysis is favored by salt soln. in the order:  $\text{NH}_4\text{Cl} < \text{NaCl} < \text{KNO}_3 < (\text{NH}_4)_2(\text{COO})_2$  and  $\text{NH}_4$  citrate.

The last 2 do not in all cases favor peroxidase liberation. In but few plants does the removal of Ca promote the liberation. Taka-diasase (contg. proteolytic enzyme) favors liberation. In chromogen-rich plant tissue (e. g., etiolated bean leaves) the quantity of peroxidase is diminished, since it is used up during autolysis in oxidation of the chromogen. *N*-sucrose soln. hinders peroxidase liberation. In chromogen-rich tissue, sucrose prevents formation of chromogen during autolysis so that the peroxidase is not used up by oxidizing it. A coenzyme which is extd. by  $\text{CH}_3\text{OH}$  is necessary for peroxidase activity. Ehrlich's side-chain theory applies to enzymes. The side chains ("receptors") are links between the cell and its environment. Enzymes are such receptors, which can be excreted in the cell sap, and seemingly can also be removed from the cell sap and unite with the protoplasts. The existence of enzymes bound up with the protoplasts is the cause of the fermentative action of the protoplasm, which theory should be discarded. The idea of a peroxidase proenzyme requires examn.

GEORGE ERIC SIMPSON

The chemical composition of green plants. XXIII. The occurrence of malic acid in plants. HARTWIG FRANZEN AND ERNST KEYSSNER. *Biochem. Z.* 135, 183-216 (1923). XXIV. The occurrence of citric acid in plants. HARTWIG FRANZEN AND FRITZ HELWERT. *Biochem. Z.* 135, 384-415 (1923); cf. *C. A.* 16, 3499; 17, 2303.—Surveys of the literature with extensive bibliographies. In many cases the reported occurrence of these acids in plants is based on insufficient evidence. A list of 15 plants in which malic acid occurs, and a list of 16 in which citric acid occurs, are given.

GEORGE ERIC SIMPSON

Chemical investigation of Japanese yew leaves. HEISABURO KONDO AND UMETARO AMANO. *J. Pharm. Soc. (Japan)* No. 490, 1074-84 (1922).—Japanese yew, *Taxus baccata* L. subsp. *cuspidata* Pilg, is slightly different from European species, *Taxus baccata* L., which is known to contain an alkaloid, taxin, and a glucoside, taxicatin. The leaves are used as a drug for abortion and diabetes in Japan. From alc. ext. of the leaves and twigs, a white amorphous powder was obtained, which shrinks at  $82^\circ$ , and m.  $105-10^\circ$  to a light yellow transparent liquid. From its compn.,  $\text{C}_{27}\text{H}_{45}\text{NO}_{10}$ , it was shown to be identical with taxin. However, 5% alc. soln. gives  $[\alpha]_D^{18} + 32^\circ 20'$ , and 10%,  $+ 35^\circ$  (av.  $33^\circ 40'$  which is  $18^\circ$  less than that found by Winterstein). When the taxin is decompd. with dil. acid, a trace of black resinous substance ppts. out and the filtrate reduces Fehling soln. On addn. of  $\text{NH}_3$  the original taxin can be recovered (although in slightly less amts.). After hydrolysis with an emulsion the Fehling test is positive, but the osazone test is negative, and the original taxin can be identified. On hydrolysis with 0.2 *N* alc. KOH,  $\text{HCO}_2\text{H}$ , AcOH, a cryst. acid (m.  $133^\circ$ ), and an amorphous acid are obtained. The taxin is, therefore, not a glucoside, but reducing action after hydrolysis is due to  $\text{HCO}_2\text{H}$ . When a glacial AcOH soln. of taxin was treated with Br in glacial AcOH, a yellow amorphous compd.,  $\text{C}_{27}\text{H}_{45}\text{NO}_{10}\cdot\text{Br}_2$ , was formed. From dil.  $\text{H}_2\text{SO}_4$  soln. with Br water, a compd. having  $\text{C}_{27}\text{H}_{45}\text{NO}_{10}\cdot\text{Br}_2\cdot\text{HBr}$  or  $\text{C}_{27}\text{H}_{45}\text{O}_{10}\cdot\text{Br}_2\cdot\text{NBr}$  was obtained.

SHIRO TASHIRO

The seeds and fruits of the fumitories. III. Investigation of the seeds of a few papavers. J. GREER. *Z. Nahr. Genussm.* 45, 156-7 (1923).—The seeds of *Papaver dubium*, *P. argemone* and *P. rhoeas* are described and their structures compared with that of *P. somniferum*.

D. B. DILL

#### IE—NUTRITION

PHILIP B. HAWK

NORMAL

Cod-liver oil in the winter feeding of milch cows. J. C. DRUMMOND, K. C. COWARD, J. GOLDING, J. MACKINTOSH, AND S. S. ZILVA. *J. Agr. Sci.* 13, 144-52 (1923).—Confirmation is offered in support of the relationship between the presence of vitamin A in the milk and its supply in the food. The influence of this supply on the quantity or fat content of the milk is uncertain, being much less than that produced by turning the cows out to grass. The increase of the vitamin A content of the milk produced by feeding cod-liver oil is not accompanied by a rise in the lipochrome pigments as is the case when the cows are fed on grass. Doses as large as 4 oz. per day of a good quality of oil produced no fishy flavor in the milk or butter. Stall feeding even when ensilage was used causes the winter milk to be lower in vitamin content than summer milk.

R. B. DEEMER

The influence of growth on the basal metabolism of children. C. B. FLEMING. *Am. J. Diseases Children* 25, 85-88 (1923).—A discussion of the relation between the decrease in the rate of growth as age increases and the corresponding decrease in basal metabolism.

I. NEWTON KUGELMASS

**The influence of phosphoric acid ingestion on the chloride excretion.** WILHELM RÖCKEMANN. *Arch. Kinderheilk.* 72; 161-71(1923).—Phosphoric acid metabolism is definitely related to the chloride metabolism. On ingestion of  $\text{NaH}_2\text{PO}_4$  the chloride excretion is decreased, indicating a chloride retention. Chloride excretion assumes normal values when phosphoric acid is no longer administered. This change in the chloride excretion effected by phosphoric acid is interpreted on the basis of "antagonism."

I. NEWTON KUGELMASS

**Problems in the field of animal nutrition.** E. B. FORBES, H. S. GRINDLEY, F. B. MORRISON, C. H. ECKLES AND C. R. MOULTON. *Science* 57, 567-71(1923).—Report of the Subcommittee on Animal Nutrition of the National Research Council.

H. B. LEWIS

**The chemical defense mechanism of the fowl.** J. H. CROWDER AND C. P. SHERWIN. *J. Biol. Chem.* 55, 15-31(1923).—In the fowl benzaldehyde is oxidized to  $\text{BzOH}$  and then conjugated with ornithine to form  $\alpha,\beta$ -dibenzoylornithine (ornithuric acid). *p*-Hydroxybenzaldehyde is oxidized to the acid and excreted in that form as in the human organism; in the lower animal organisms it is conjugated in part to form *p*-hydroxyhippuric acid. Phenylpropionic acid first undergoes  $\beta$ -oxidation, forming  $\text{BzOH}$  (as occurs also with man and the lower animals) and is then conjugated and excreted as ornithuric acid. Cinnamic acid is also oxidized to  $\text{BzOH}$  and excreted as ornithuric acid. *m*-Nitrobenzaldehyde is converted by the rabbit into *m*-acetylaminobenzoic acid and by the dog into *m*-nitrohippuric acid; in the fowl it is apparently reduced and oxidized simultaneously, forming apparently an inner anhydride of *m*-aminobenzoic acid.  $\text{PhNO}_2$  is converted into *m*-aminophenol as it is in all the exptl. animals thus far employed. In dogs and rabbits *o*-nitrophenylpropionic acid is converted into indican but in the fowl only  $\beta$ -oxidation of the side chain occurs with the formation of *o*-nitrobenzoic acid. *m*-Aminobenzoic acid is acetylated to form *m*-acetylaminobenzoic acid by the fowl; the dog converts it into either *m*-uraminobenzoic or *m*-aminohippuric acid or excretes it unchanged. The fowl thus can oxidize aromatic acids according to the rule of  $\beta$ -oxidation, can reduce aromatic nitro compds. with or without simultaneous oxidation within the same mol., and is able to methylate and acetylate; it cannot apparently form uramino compds. nor furnish glycocholic for conjugation purposes but can produce ornithuric in relatively large amts., a reaction which, as far as is known, is the exclusive property of the bird.

A. P. LOTHROP

**Studies in pyrimidine metabolism.** D. W. WILSON. *J. Biol. Chem.* 56, 215-27(1923).—"The presence of pyrimidines in the urine of animals after feeding the free compds. and their absence after feeding pyrimidines combined in the form of nucleic acid suggested a study of the effects of feeding other combinations of the pyrimidines, the hydrolytic products of yeast nucleic acid. Uracil nucleoside and a mixt. of cytosine and uracil nucleotides were prepd. and fed to rabbits. A single expt. was carried out on man. When the pyrimidine, uracil, is taken into the body it is quant. excreted unchanged. But when uracil combined in the form of a nucleoside or nucleotide is administered only a small portion of the uracil is excreted. The uracil of yeast nucleic acid, however, seems to suffer complete destruction within the organism. Free thymine and the thymine in animal nucleic acid were found by Sweet and Levene to show the same relationships. The data offer an insight into the intermediary metabolism of the pyrimidine fraction (at least the uracil fraction) of the nucleic acids. After the ingestion of nucleic acid the pyrimidines are destroyed in the body and their N is excreted in the form of urea. The first step in metabolism is not a splitting off of the pyrimidine group from the nucleic acid but some change in the pyrimidine such as the splitting of the ring, even before the nucleic acid is broken up into its simple nucleotides and nucleosides. Observations with purine compds. offer a striking parallelism. Thus it appears that the intermediary metabolism of nucleic acids involves radical changes in both the purine and the pyrimidine groups before the relatively complex combinations are broken up."

A. P. LOTHROP

**Studies in creatine and creatinine metabolism.** V. The metabolism of creatine. S. R. BENEDICT AND EMIL OSTERBERG. *J. Biol. Chem.* 56, 229-52(1923); cf. *C. A.* 16, 2358.—The expts. were conducted to obtain, if possible, clear-cut evidence as to whether creatine is or is not the normal biological source of creatinine. Dogs were brought into approx. N equil. upon a const. diet and were then fed daily a small amt. of creatine mixed with their food until an appreciable amt. of the administered creatine was accounted for in some form in the urine. The 3 expts. continued for periods of 84, 92 and 128 days, resp. With 1 animal there was a preliminary period of 9 days, 10 periods of 7 days each during which 0.62 g. of creatine was fed daily, and 7 after periods of 7 days each. During the 1st period of creatine ingestion, no creatine appeared

as such in the urine and there was no apparent effect upon creatinine elimination; there was a retention of N equal to more than twice that contained in the creatine. On the 10th day 32 mg. of creatine was excreted which within 5 days had reached 147 mg. for 1 day. This points to a retention of creatine as such for a considerable period and many days are required to fill the creatine reservoir, indicating a very slow rate of metabolism for creatine. Increased retention of N occurred, the result suggesting that creatine may cause N storage in the body far beyond that contained in the creatine itself. As the period of creatine feeding was extended there was a slow but continuous increase in the urinary creatinine up to the end of the 10th period when the output was 33% above that of the control period. The max. excretion of creatine was reached in the 4th period and was maintained approx. const. as long as the creatine feeding was continued; the amt. eliminated amounted during these periods to 50% of that given. Retention of N continued, the dog increasing altogether 1.3 kg. in wt. The 1st day after withdrawal of creatine from the food, the amt. of creatine in the urine fell to a scarcely detectable amt. and at no subsequent time could any creatine be detected. On the other hand there was a slow and continuous, though irregular, drop in the creatinine excretion reaching the original level during the 5th after period. After discontinuing the creatine the wt. of the animal remained approx. const. "The expts. seem to establish definitely the origin of urinary creatinine from creatine and Folin's view of the biological independence of creatine and creatinine is shown to be incorrect. However, the work demonstrates that the metabolism of creatine is unique in many respects. Direct conversion of creatine into creatinine is apparently not a normal process in the animal organism. One or more intermediate reactions are probably involved. The quantity of creatine which can be metabolized is closely limited and the quantity of creatinine which can be formed is also restricted. The metabolism of creatine is, unlike that of other N compds., very slow, requiring days or more probably weeks for its completion." Creatinine is but one of the end-products of creatine metabolism as only 1 mol. of creatinine is obtained for every 3 mols. of creatine metabolized. The process by which creatinine is formed from creatine should be considered as one of definite significance and fundamental importance to living tissue rather than as merely a way of ridding the system of waste creatine. Creatinine formation must remain as the most strictly endogenous form of metabolism so far known, but under suitable conditions it is possible to raise this form of metabolism by about 30% so that the absolute line between endogenous and exogenous metabolism is removed. No data are at present available concerning the mechanism of the storage of creatine in the animal body and the peculiar function of creatine in the body must remain an unsolved question for the present. Further expts. on various phases of the subject are in progress.

A. P. LOTHROP

**Humanized and maternized milk.** L. P. *Lacta* 1, 17 (July 1920).—Whey from breast milk when mixed with casein and butter from cow milk is an excellent food for infants; but whey from cow milk mixed with casein and butter fat from breast milk can cause serious disturbance, which is avoided by removing the albumin from the whey. Addn. of 15 g. of casein per l. of dild. cow milk causes no disturbance.

A. PAPINEAU-COUTURE

#### ABNORMAL

**Calcium absorption in children on a diet low in fat.** L. E. HOLT AND HELEN L. FALES. *Am. J. Diseases Children* 25, 247-56 (1923).—Marked reduction of fat in children's diet changes the character of their stools from smooth, normal, alkaline and well digested to acid and foul with food residues and excessive fermentation. On a low-fat diet there is also an increase of total solids, total ash and the percentage CaO in the stool.

I. NEWTON KUGELMASS

**The production of kidney lesions in rats by diets defective only in that they contained excessive amounts of protein.** L. M. POLVOGT, E. V. MCCOLLUM AND NINA SIMMONDS. *Bull. Johns Hopkins Hosp.* 34, 168-72 (1923).—The diets contained from 31 to 41.3% of protein and were otherwise adequate as regards all the other constituents necessary for growth, maintenance and reproduction. The observations on the kidneys were made when the rats had reached an age of about 400 days and a number of their progeny were maintained on the diet until from 250 to 400 days old. All the rats had lesions of the kidneys of considerable severity, even comparatively young animals of the 5th generation. There was intense congestion and the formation of hyaline casts in large numbers. On the other hand the animals appeared normal to external inspection and were alert and active. "The compn. of the diets leaves no room for doubt that, if protein is eaten in too high a concn. under certain conditions, the end-products of its metabolism may seriously damage the kidney. The data do not permit the criticism

that defects in the diet other than protein may have been partially or indeed solely responsible for the kidney lesions observed." A. P. LOTHROP

## F—PHYSIOLOGY

ANDREW HUNTER

**The relation of the pancreatic gland to the lipolytic capacity of the blood and tissues.** W. E. STAWRAKI. *J. Pure Applied Knowledge* (Russian), Odessa, 1, No. 2(1921); *Physiol. Abstracts* 7, 592.—Three healthy and 7 depancreatized dogs were investigated on the 6th, 9th, 20th, 22nd, and 37th day after the operation. The lipolytic capacity of nearly all the tissues was estd. stalagmometrically and by titration with 0.01 *N* KOH. Satd. solns. of mono- and tributyrin were used as substrate. The lipolytic capacity of the blood and tissues was not altered by extirpation of the pancreas. This gland is thus not the source of blood- and tissue-lipase. The organs arranged in their lipolytic capacity are: liver, kidneys, lungs, thyroid, skeletal muscles, submaxillary, lymphatic glands, suprarenals, testis, spleen. The brain and heart muscle show no lipolytic action. H. G.

**The composition of secretions obtained from the udders of heifers during pregnancy.** H. E. WOODMAN AND J. HAMMOND. *J. Agr. Sci.* 13, 180-91(1923).—Total protein, caseinogen, globulin, albumin, non-protein N, fat, lactose and ash of the secretions are reported for various periods during pregnancy. A full discussion of results obtained is given. It is suggested that the honey-like secretions may be found useful in the prepn. of concd. antitoxins. R. B. DEEMER

**Fibrinolysis. IV. The antagonistic behavior of the fibrinolytic- and lysis-retarding substances that occur in body fluids and organ extracts, and a method for separating them.** MAX ROSENEMANN. *Klin. Wochschr.* 2, 450-1(1923); cf. *C. A.* 16, 2549.—An exudate that showed some antifibrinolytic action was dialyzed against running water for 3 days (CHCl<sub>3</sub> and toluene as preservatives). The pptd. globulins were markedly fibrinolytic; the filtrate from the globulins was more markedly antifibrinolytic than the original exudate. Similar results were obtained when oxalated horse plasma and serum were dialyzed, but in this case the fibrinolytic action of the pptd. globulins was very slight. MILTON HANKE

**Chemical studies of the blood of mother and fetus.** M. G. HOWE AND M. H. GIVENS. *Am. J. Diseases Children* 25, 63-75(1923).—The non-protein N and urica N in maternal blood at parturition are normal. The values vary but there is no consistent preponderance in either blood. Differences are attributed to maternal or fetal renal insufficiency or impairment of placenta. The concn. of blood uric acid of parturient women tends to be higher than normal. The concn. of blood sugar is temporarily increased at parturition, maternal values being greater than fetal. This is due to the anesthetic, to muscular contractions and possibly to a psychic factor. I. NEWTON KUGELMASS

**The excretion of foreign protein in human milk.** H. C. STUART. *Am. J. Diseases Children* 25, 135-56(1923).—S. fails to detect egg-white protein in the breast milk of mothers. I. NEWTON KUGELMASS

**The water content of infants' blood during periods of rapid increase in weight.** HARRY BAKWIN. *Am. J. Diseases Children* 25, 406-10(1923).—Blood water concn. was detd. refractometrically before and after marked wt. increases of the children studied but no change in the water content of the plasma was observed. Increase in tissue fluid may occur in healthy, artificially fed infants without any increase in the water content of the plasma. I. NEWTON KUGELMASS

**Physiology and pathology of digestion in infants. I. Acidity of feces.** KURT SCHEER AND FRITZ MULLER. *Jahrb. Kinderheilk.* 101, 143-58(1923).—Stool acidity is a function of food intake since mothers' milk and food rich in sugars yield acid feces while cows' milk or mothers' milk with additions of buffer substances give alk. stools. Stool acidity also depends on the frequency of excretion; several stool excretions per day are acid while less frequent excretions are alk. The acidity finally depends on the buffer values of the feces for high buffering substances make it less acid than low buffered stools. I. NEWTON KUGELMASS

**Creatinine and creatine in muscle extracts. IV. Concerning the formation of creatine from methylguanidine in muscle.** F. S. HAMMETT. *J. Biol. Chem.* 55, 323(1923); cf. *C. A.* 16, 3668.—Exts. of muscle tissues from albino rats of both sexes, 80 to 150 days old, buffered with phosphate mixts. to acid and alk. reaction, with and without the addition of AcONa, parathyroid tissue and exts. of liver tissue were incubated with methylguanidine and the exts. analyzed for their total creatine content. The results were negative in all cases and the "hypothesis that methylguanidine is a

precursor of creatine through intermediation of muscle activity is unsupported by the *in vitro* expts." H. is inclined towards the view of Biedl that methylguanidine (supposedly found in the muscle and urine of parathyroidectomized animals) and creatine are derived from a common precursor as yet unidentified. A. P. LOTHROP

Studies of the blood chemistry in allergy. R. H. MAJOR. *Bull. Johns Hopkins Hosp.* 34, 104-7(1923).—"The repeated injection of horse serum into rabbits produces marked changes from the normal blood chemistry. These changes are most marked when the animal is on a deficiency diet. The blood non-protein N, urea and creatinine are increased in the after-anaphylactic shock; the blood chlorides are usually diminished. Urinary studies show there is usually a diminution in the N and NaCl excretion and an increase in creatinine on the day following anaphylactic shock. There is evidence that these changes are due both to a renal and an extra-renal factor."

A. P. LOTHROP

Synthesis of amino acids in the animal organism. II. The synthesis of ornithine in the body of the fowl. JAMES H. CROWDLE AND CARL P. SHERWIN. *J. Biol. Chem.* 55, 363-71(1923).—"Apparently, ornithine can be synthesized from the waste uric acid N. The ingestion of amino acids other than arginine does not seem to increase greatly the output of ornithuric acid, apparently contradictory to the theory that histidine is convertible quite easily into arginine, for ingested histidine does not augment ornithuric acid excretion while arginine does. Proline and histidine seem to increase in particular the urea output while arginine adds to the creatine-creatinine fraction. The greater part by far of all this amino-acid N appears in the excreta of hens as uric acid N."

A. P. LOTHROP

The relation of lipoids to suprarenal physiology. I. The cholesterol and lipid phosphorus contents of the blood of rabbits before and after suprarenalectomy. E. J. BAUMANN AND O. M. HOLLY. *J. Biol. Chem.* 55, 457-73(1923).—"There is no evidence for the hypothesis of Grigaut (*C. A.* 7, 503) that the suprarenals are the seat of cholesterol formation. Nor is there at present reason to believe that these glands act as a storehouse for cholesterol. The cholesterol and lipid P contents of the blood were studied before and after unilateral and bilateral suprarenalectomy in 12 rabbits. There was no significant change in the blood cholesterol until the last week of life when it rose. The lipid P increased occasionally after unilateral and invariably after bilateral suprarenalectomy. A terminal rise was also noted as in the case of cholesterol. This terminal lipidemia is best explained as a premortal phenomenon. No direct relation between the plane of metabolism and the blood lipoids could be established."

A. P. LOTHROP

Investigations on the immediate effect of heavy exercise (stair-running) on some phases of circulation and respiration in normal individuals. II. Oxygen and carbon dioxide content of blood drawn from a cubital vein at different intervals after exercise. CHRISTEN LUNDSGAARD AND EGGERT MÖLLER. *J. Biol. Chem.* 55, 477-85(1923); cf. *C. A.* 17, 1662.—The expts. were undertaken to det. how soon the values for the  $O_2$  satn. of venous blood return to normal after heavy leg exercise. The  $O_2$  content of blood drawn from a cubital vein after fast stair-running (5 times) remains low for only about 1 min. after the exercise is finished and 2 to 4 min. after exercise the venous blood may contain almost as much  $O_2$  as arterial blood. The value becomes more like the "normal av." after 5 to 8 min. The  $CO_2$  content decreased from 5 to 10 vols. % during the first few min. after completion of the exercise, probably because of accumulation in the blood of fixed acids (lactic acid) produced in the muscles of the lower extremities during exercise. Further expts. are necessary before a discussion of the underlying causes of the changes in the  $O_2$  content of the blood is presented. A. P. LOTHROP

Studies in the physiology of muscular exercise. I. Changes in acid-base equilibrium following short periods of vigorous muscular exercise. D. P. BARR, H. E. HIMWICH AND R. P. GREEN. *J. Biol. Chem.* 55, 495-523(1923).—"During and following vigorous muscular exercise, the acid-base equil. of the blood undergoes changes which are comparable in degree to those observed in severe diabetes or nephritis and which may occur often in the daily life of any active, healthy individual. The investigation is concerned with the direction, extent and duration of these changes." A Krogh bicycle ergometer was used and blood was obtained from the brachial artery and from an arm vein without pressure, each sample being analyzed for  $CO_2$  and  $O_2$  content and  $CO_2$  capacity. Following short periods of vigorous exercise the  $CO_2$ -combining capacity is greatly diminished, the arterial  $CO_2$  tension is reduced and the reaction of both arterial and venous blood becomes less alk. The degree of change is subject to considerable variation in different normal individuals. The change in  $CO_2$  capacity is accompanied by an increase in lactic acid but no strict quant. relationship could be demonstrated

between the observed increase and that calcd. from the change in  $\text{CO}_2$  capacity. The efficiency of the blood as a  $\text{CO}_2$  carrier is diminished by exercise. Easy muscular exercise (about 2,000 kg. m.) may be performed with scarcely any detectable changes in the acid-base equil. of venous blood. With heavier work the degree of change, both in reaction and  $\text{CO}_2$ -combining capacity, increases rapidly with each small increase in the amt. of work. The max. amt. of work which the subject was able to do in the allotted time without fatigue and pain in the calf muscles was 4,530 kg. m. and when that amt. of work was performed the  $p_{\text{H}}$  was reduced 0.14 and the  $\text{CO}_2$  capacity 14.6 vols. %.

**II. Comparison of arterial and venous blood following vigorous exercise.** D. P. BARR AND H. E. HIMWICH. *Ibid* 525-37.—The  $\text{CO}_2$ -combining power of venous blood is always higher than that of arterial blood when both samples are drawn simultaneously from the arm 3 min. after vigorous exercise with leg muscles; the difference varies from 0.6 to 6.4 vols. % (av. 4 vols. % in 9 expts.). This higher capacity of venous blood may be accounted for by a decrease in lactic acid due to its removal from the circulating blood during its passage through the tissues of the arm. After vigorous exercise with the muscles of the forearm the  $\text{CO}_2$  capacity of the venous blood is the same or less than the arterial capacity and the lactic acid content is greater in the venous blood. "The expts. indicate that 3 min. after exercise, lactic acid is still escaping into the blood as it returns from exercising muscles. At the same time, the less active tissues are removing it rapidly as the blood passes through them. The lactic acid content and presumably the  $\text{CO}_2$  capacity, which are found in arterial and venous blood at any instant after exercise, depend upon the relative rates at which lactic acid is produced and removed. Surprisingly close agreement was found between the reaction of arterial and venous blood in 8 out of 11 expts.; in 2 instances the venous blood was less alk. and in 2 it was more alk. The great difference in  $\text{CO}_2$  capacity between arterial and venous blood makes it impossible to draw any conclusions concerning arterial conditions from a study of venous samples after exercise."

**III. Development and duration of changes in acid-base equilibrium.** *Ibid* 539-55.—With 3.5 min. of work, the  $\text{CO}_2$  capacity of arterial blood was diminished during the 2nd min. of exercise and became progressively lower during the exertion and for 3 or more min. after the exercise ended. The return to normal was gradual and was not complete in one case in 50 min. The  $\text{CO}_2$  capacity continues to fall until the rate of the removal of lactic acid becomes greater than the rate of accumulation. The  $\text{CO}_2$  tension increased during the first 2 min. but fell as the vol. of respiration increased and was approx. normal after 3.5 min. of exercise. It diminished progressively for several min. following the exertion, returning incompletely to normal in 30 to 50 min. after exercise. "The response to exercise is not an acapnia phenomenon. The  $\text{CO}_2$  capacity (bicarbonate) of the blood was diminished at a time (2nd min. of exercise) when the  $\text{CO}_2$  tension was increased and when the respiration was inadequate to remove all the  $\text{CO}_2$  which was produced. At no time was there an alkalosis. Even during the 2nd min. of work, there was a marked diminution in alkalinity which was progressive as the exercise continued and from 1 to 3 min. after the cessation of exercise. Return of the reaction to normal is more rapid than the return of either  $\text{CO}_2$  tension or capacity, but is delayed from 8 to 30 min. The continued diminution in the alkalinity of arterial blood is attributable to the great accumulation of lactic acid with the consequent decrease in bicarbonate content. The greater respiration and the attendant lowering of the  $\text{CO}_2$  tension tend to oppose the effect of lactic acid on the reaction, but are not great enough to prevent an acidosis from occurring nor to cause a prompt return of the reaction to normal. When the duration of work is 7.5 min., the max. changes in  $\text{CO}_2$  capacity,  $\text{CO}_2$  tension, and reaction may occur during exercise. Changes in the  $\text{CO}_2$  capacity and reaction of venous blood from an arm vein are in the same direction as those of arterial blood. The  $\text{CO}_2$  tension, however, may remain higher than normal for 3 min. after the end of exercise."

A. P. LOTHROP

**The catabolism of caproic acid and its derivatives.** H. D. DAKIN. *J. Biol. Chem.* 56, 43-51 (1923).—The expts. were performed to det. whether an unsatd.,  $\beta$ -hydroxy-, or  $\beta$ -ketonic acid is first formed by the oxidation of caproic acid *in vivo*. The following acids were perfused through the surviving livers of dogs: caproic,  $\alpha,\beta$ -hexenic,  $\beta$ -hydroxycaproic, and butyrylacetic. Each one of these acids under similar conditions of perfusion gave rise to large amts. of acetoacetic acid,  $\text{Me}_2\text{CO}$ , and  $\beta$ -hydroxybutyric acid but the quant. differences between the various acids as precursors of "acetonc bodies" were insufficient to indicate which, if any, was preferentially produced from caproic acid. The total amt. of acetone bodies obtained from the 4 acids was not widely different. These expts. thus do not give any satisfactory answer as to which product is first formed by the oxidation of caproic acid and it is probable that all the acids are in



readily shifting equil. with each other and are easily interconvertible. A method is described for the *detn. of acetone in the presence of propylmethyl ketone*. A. P. LOTHROP

**Aqueous extracts of pancreas. I. Influence on the carbohydrate metabolism of depancreatized animals.** J. R. MURLIN, H. D. CLOUGH, C. B. F. GIBBS AND A. M. STOKES. *J. Biol. Chem.* **56**, 253-96(1923); cf. *C. A.* **7**, 3357; **11**, 359, 360, 482; **17**, 1070.—"Acid aq. exts. of cat pancreas raised the respiratory quotient in 2 different expts. from the diabetic level to 0.82 and 0.87, resp. Exts. of pig and ox pancreas were found to be about equally effective for reducing the blood sugar and the D:N ratio of depancreatized dogs when given intravenously, subcutaneously, and intraperitoneally. Exts. made in acidulated  $H_2O$  were just as effective as those made in acidulated alc., allowance being made for concn. Extremely toxic effects are obtained if the trypsin is not completely destroyed or if the acid is not completely neutralized before administration. Boiling in acid medium for at least 5 min. does not destroy the principle. Filtering through charcoal and Lloyd's reagent removes a large amt., if not all, the insulin. Charcoal, therefore, should prove to be a satisfactory absorbent for insulin. There are two substances in these aq. exts., one of which lowers the blood sugar and the D:N ratio and raises the respiratory quotient (insulin); the other raises the blood sugar of both normal and depancreatized animals and possibly causes an abrupt fall in the respiratory quotient to the diabetic level after 3-5 hrs. A more complete report on the latter fraction will be made soon. The abrupt fall in the respiratory quotient referred to has been observed with considerable regularity. It can scarcely be due to exhaustion of the insulin for the quotient rises again later. The method of stomach administration used (ext. together with a sufficient amt. of 0.05 *N* NaOH to neutralize the gastric juice, thereby inactivating the pepsin) has given positive results almost uniformly. The min. dose of ext. necessary to give a perceptible rise of quotient by this method is equiv. to about 125 g. of fresh ox pancreas. With double this dose the effect in one expt. was a rapid rise in the quotient to over 1.0. Even with the min. dose necessary to produce a rise of quotient there follows in the course of 24 hrs. a large utilization of glucose. In one instance where no alkali was used, but only ext. and sugar were given by mouth, the utilization of sugar was considerably above the amt. ingested as sugar. This portion must have been salvaged from the meat ingested, or from protein of endogenous origin." The investigation is a continuation of expts. performed in 1913-16 which are in accord with the recent findings of Banting and Best (*C. A.* **16**, 1980, 2905) concerning the presence in pancreatic tissue of a substance capable of restoring to the diabetic animal the ability of utilizing glucose. A. P. LOTHROP

**Comparison of the effects of nucleic acids and of antithrombin of the plasma with peptone upon the coagulability of circulating blood in the frog.** DOYON. *Compt. rend.* **174**, 1729-30(1922).—Expts. showed that the injection of a single and very small dose of nucleic acid renders the circulating blood of the frog uncoagulable for several hrs. and even days. The phosphorized antithrombin anticoagulant, which occurs in the blood of the dog under the influence of injections of peptone, has an action on the frog similar to that of nucleic acids. It is suggested that the phosphorized antithrombin from the plasma by peptone proceeds from the nuclei of the cells and owes its activity to the phosphorized group which it contains. L. W. RIGGS

**The cholesterol content of different rabbit muscles.** G. EMBDEN AND HEINZ LAWACZECK. *Z. physiol. Chem.* **125**, 199-209(1923).—The biceps femoris (white muscle) contains 0.04-0.06% cholesterol, while the semitendinosus and diaphragm (red muscles) contain 0.07-0.10%; the heart contains 0.12-0.16%. The greater the capacity for sustained work the greater is the cholesterol content; a similar relation has already been described for the rest  $H_3PO_4$  of muscle (cf. *C. A.* **16**, 282). R. L. STEHLE

**Further investigations of the cholesterol content of different muscles.** HEINZ LAWACZECK. *Z. physiol. Chem.* **125**, 210-9(1923); cf. preceding abstr.—Similar relations were observed in various muscles of cocks, frogs and toads. R. L. STEHLE

**Chemical differences between skeletal muscles of the calf and cow.** KAZUO HOTTA. *Z. physiol. Chem.* **125**, 220-8(1923); cf. 2 preceding abstracts.—The biceps of the calf contains more rest  $H_3PO_4$  and cholesterol than that of the cow, but there is no evidence of any greater capacity for work on the part of the former. R. L. STEHLE

**Muscle respiration and sarcoplasm.** G. EMBDEN AND H. LANGER. *Z. physiol. Chem.* **125**, 258-83(1923).—If one transfers a resting muscle from oxygenated Ringer soln. to an isotonic sucrose soln. its respiration is greatly increased; on replacing in Ringer soln. the original respiration rate is reestablished. The increased respiration is conditioned by swelling in the muscle fiber membranes (sarcoplasm), this swelling being indicated by the increased  $H_3PO_4$  elimination. Kidney and liver show no such behavior. The superficial layer of sarcoplasm is believed to be the seat of oxidation in muscle fibrils. R. L. STEHLE

## G—PATHOLOGY

H. GIDEON WELLS

**Blood changes during anaphylactic shock.** ERICH WITTKOWER. *Klin. Wochschr.* 2, 450(1923).—Anaphylactic shock was induced in guinea pigs, after sensitization with horse or human serum. Blood was withdrawn either immediately after the death of the animal or just before the heart stopped beating. The following changes in the compn. of the blood were noted: coagulability markedly decreased; speed of corpuscle sedimentation was reduced; m. p. of blood reduced;  $H_2O$  content reduced; total protein increased; albumin increased; globulin unchanged in amt. but changed in colloidal behavior so that it pptd. as a gelatinous mass with  $(NH_4)_2SO_4$ ; proteoses unchanged; amino acids increased; non-protein N increased; fibrinogen and fibrin enzyme decreased; complement concn. decreased; H ions increased; Ca ions decreased; NaCl and erythrocytes increased in proportion to the thickening of the blood; blood corpuscles less resistant to hypertonic NaCl but not to saponin; marked leucopenia with relative lymphocytosis; eosinophilia by subacute anaphylaxis; increased fragility of white blood cells; blood platelets reduced (during shock), increased after non-fatal shock; adrenaline content of adrenals unchanged.

MILTON HANKE

**Quantitative analysis of bone ash from cases of war osteopathy.** WILHELM LOLL. *Klin. Wochschr.* 2, 594(1923).—Analysis of normal bones gave CaO 51.8-52, MgO 0.78-0.85,  $P_2O_5$  38.7-38.9, rest 8.55%. Osteopathic bones: ribs and pelvic bones gave CaO 56.8-76.8, MgO 0.74-0.80,  $P_2O_5$  16.2-37.3, rest 4.04-8.59%. Tibia gave CaO 54.5-54.8, MgO 0.77-0.81,  $P_2O_5$  36.1-36.8, rest 7.61-8.59%. MILTON HANKE

**The use of "yatrene" to conserve sera and antisera for medico-legal tests.** G. STREASSMANN. *Deut. med. Wochschr.* 48, 487(1922); *Bull. mens. office intern. d'hyg. publ.* 15, 267(1923).—Yatrene is an I deriv. of pyridine which has antiseptic properties but is without effect on living tissue, the phagocytic power of leucocytes, or the agglutinating power of antibodies. It has been given by mouth to animals and man. It is sol. in water to 5%, in horse serum to less than 5%. S. has used it to preserve serum to be inoculated into rabbits and then for the antisera obtained by inoculations. Sera to which yatrene has been added remain clear. A dose of 1 to 3% insures sterility and allows serum to be preserved for some months at ordinary temp.

JACK J. HINMAN, JR.

**Studies of tetany. I. The effect of calcium chloride ingestion on the acid-base metabolism of infants.** J. L. GAMBLE, G. S. ROSS AND F. F. TISDALL. *Am. J. Diseases Children* 25, 455-69(1923).—Ingested  $CaCl_2$  behaves as an acid substance since the concn. of Cl ion absorbed is greater than the concn. of the Ca ion. The effect on acid-base metabolism of the ingestion of 1 g. of  $CaCl_2$  is equiv. to that of ingestion of milk contg. 75 cc. of 0.1 N HCl. This increase in acid over fixed alkali claiming excretion in the urine is compensated for by an increase in urinary acidity and ammonia excretion resulting in a normal base concn. of the blood plasma. The lowering of bicarbonate following  $CaCl_2$  ingestion is due to a rise in Cl-ion concn. displacing an equiv. amt. of bound  $CO_2$ . Fixed alkali excretion, especially Na and K in the urine, is increased following ingestion of  $CaCl_2$ . This is a consequence of a reduction of the vol. of body water rather than an actual withdrawal of base from body fluids. II. **The effect of ingestion of hydrochloric acid-producing substances on the acid-base metabolism of an infant and the probable manner of their action in the treatment of tetany.** J. L. GAMBLE AND G. S. ROSS. *Ibid* 470-97.—Plasma bicarbonate is lowered following the administration of  $CaCl_2$ ,  $NH_4Cl$  and HCl to an infant with tetany. The reduction of bicarbonate is a consequence of an increased metabolism of HCl which causes an extension beyond the normal of the Cl-ion content of the plasma at the expense of bicarbonate. Total plasma base remains closely stationary. With ingestion of these HCl-producing substances there is a considerable increase in the  $c_H$  of the plasma. The metabolism of these substances leads to an increased excretion of phosphates and of fixed alkali in the urine as a consequence of a reduction of the vol. of body water due to the diuretic action of the ingested compds.  $NH_4Cl$  does not raise the lowered Ca content of the plasma found in tetany. The therapeutic action of this salt may be referred to an increased metabolism of HCl, which causes a lowering of bicarbonate and an increase in the plasma  $c_H$ , both of which alterations tend to produce an increased ionization of Ca.  $CaCl_2$  and HCl are therefore more efficient agents than  $NH_4Cl$  in the treatment of tetany in that they cause an increase in the total plasma Ca in addition to the already cited physicochemical changes.

I. NEWTON KUGELMASS

**Acidosis and hyperglucemia in toxic symptom complexes of infants.** STEFAN EDERER AND EUGEN KRAMAR. *Jahrb. Kinderheilk.* 101, 159-174(1923).—Acid intoxi-

cation of blood plasma decreases the bicarbonate but the blood sugar content is variable and not consistently parallel to the degree of acidosis. Toxic respiration manifests itself at a bicarbonate concn. of 30 vols. %. Co-prevalance of glucosuria shows high blood sugars which are not necessarily related to sugar excretion.

I. NEWTON KUGELMASS

**The influence of the addition of cholesterol on the Wassermann reaction. I. The suitability of cholesterolized beef heart extract in the serum diagnosis of human syphilis.** FR. GRAETZ. *Z. Immunitäts.* 31, 431-54(1921).—Confirming Sachs, G. finds cholesterolized beef heart antigen extremely valuable for the Wassermann reaction, inasmuch as specificity remains, with much increased sensitiveness. The cholesterolized antigen is often the only one giving a positive reaction with certain syphilitic serums. It has the further advantage that its action is independent of the temp. With a few syphilitic serums a cholesterol-free ext. is more effective. Certainty of diagnosis is achieved when the test is made with cholesterolized and cholesterol-free exts. simultaneously.

E. R. LONG

**The question of the titration of complement in the Wassermann reaction.** W. GAERTGENS. *Z. Immunitäts.* 33, 1-35(1921).—The Kaup modification of the Wassermann reaction has the advantages over the original method of greater sensitiveness and reliability. The use of a cholesterolized syphilitic heart ext. does not influence the specificity. The method is subject to the objection that Kaup's rule on the protective action of normal serum on the ext. does not always hold. For reliable detn. of the complement minimum required for each serum the complement must be titrated with the serum in the presence of an indifferent control fluid. A suitable one is 0.1% alc. cholesterol soln. dild. 25-30 times. Thus carried out the method gives 10% more positive reactions in syphilis than the original method. The reactions, with a few exceptions, are sp.

E. R. LONG

**Hypoglycemia in exophthalmic goiter.** E. F. HOLMAN. *Bull. Johns Hopkins Hosp.* 34, 69-70(1923).—Immediately following operation there is a marked hyperglycemia corresponding to the period of most active metabolism and the greatest mobilization of the available carbohydrate. This is followed by an abrupt fall in blood sugar due to the exhaustion of the supply. In those cases which do well there is then a rise indicating a gradual disappearance and elimination of the active thyroid secretion. These findings indicate the importance of a high caloric and carbohydrate diet in the preoperative treatment and of the administration of 5% glucose soln. *per rectum* postoperatively. A case is described in which the blood sugar fell to 0.048% accompanied by a deep stupor which was relieved by administration of glucose intravenously.

A. P. LOTHROP

**Studies of diabetes mellitus. I. Respiratory exchange following the ingestion of glucose, glycerol, calcium hexosephosphate and calcium glycerophosphate.** WM. S. McCANN AND R. R. HANNON. *Bull. Johns Hopkins Hosp.* 34, 73-80(1923).—Two types of response are encountered in the effect of the ingestion of glucose on the respiratory exchange in diabetic patients. With the first type there is a diminished rate of carbohydrate oxidation which is shown by a decrease in the respiratory quotients for an abnormal length of time. These subjects improve greatly under treatment and develop a good carbohydrate tolerance. In the second type there is a rise of respiratory quotients at a rate similar to that of normal subjects and these individuals do not respond to treatment with a maintenance diet low in protein and balanced as regards ketogenic and antiketogenic factors. A rise in heat production may or may not follow the ingestion of glucose; it occurred in subjects of the second type and may increase with falling quotients and *vice versa* in the first type. The changes in respiratory quotients on the ingestion of glycerol were parallel to those produced by glucose in the same subjects while in normal subjects there was no parallelism between the effects of these two substances. The sp. dynamic action of glycerol was negligible in all but 1 expt. In subjects of the first type the effect of the ingestion of Ca hexosephosphate indicated that the hexose from the phosphoric ester was oxidized more readily than glucose. It caused a steady rise in the quotients in both diabetic and normal individuals and a rise in heat production of from 4.5 to 12% in all expts. followed its ingestion. The effect of Ca glycerophosphate was variable and it is impossible to interpret the results in terms of the oxidation of glycerol. "The differences in the effects of glucose ingestion upon the respiratory exchange of patients with severe diabetes mellitus support the belief that there are different types of the disease corresponding to different mechanisms at fault."

A. P. LOTHROP

**Variations in the distribution of the non-protein nitrogenous constituents of whole blood and plasma during acute retention and elimination.** E. D. PLASS. *J. Biol.*

*Chem.* 56, 17-29(1923).—"The extremely rapid changes in concn. of the non-protein nitrogenous constituents of the blood during recovery from the so-called 'late toxemias of pregnancy' have been studied by simultaneous analyses of whole blood and plasma, and it has been demonstrated that these substances pass from cells to plasma, and in the reverse direction, so slowly, that at times the usual relationships are disturbed. It is particularly emphasized that the blood corpuscles are storehouses into which material accumulated in the plasma may be temporarily deposited and from which the excess may later be rapidly removed. Under such conditions it is obviously important to attack the study of certain metabolic problems from the standpoint of the blood cells as well as of the plasma." The total non-protein N is usually higher in the whole blood but the plasma may temporarily have a higher concn. during very rapid retention. During rapid relief from a rapid retention the quick excretion of urea from the plasma is not accompanied by an equally rapid diffusion out of the corpuscles nor in retention is diffusion into the corpuscles as rapid as accumulation in the plasma. Uric acid increases first in the plasma and later diffuses into the cells until the concn. comes to practical equil. During the precipitate relief of such a retention, the corpuscles may at times actually contain more uric acid than the plasma. Creatine, which is normally absent from the plasma, is present in higher concn. during the period of puerperal creatinuria, so that the curves of plasma and urinary creatine are quite similar.

A. P. LOTHROP

**Idiosyncrasy and anaphylaxis.** L. PANISSET AND J. VERGE. *Compt. rend.* 174, 1731-3(1922).—The sensibility of an organism with respect to certain heterogeneous substances may be spontaneous (idiosyncrasy) or acquired (anaphylaxis). The sensibility of an organism with respect to intravenous injections of homologous blood is more rare. From expts. with a horse it appears that this natural idiosyncrasy, which is clinically undifferentiable from anaphylaxis, is the first phenomenon by which hypersensibility is shown. True anaphylaxis depends upon a previous sensitizing and represents a more advanced and a more complete stage of anaphylaxis. L. W. RIGGS

**Adsorption of protein degradation products by the form elements of blood in vivo and in vitro.** B. SHARSKY. *Biochem. Z.* 135, 21-31(1923); cf. *C. A.* 15, 870.—Neither serum nor whole blood obtained from animals immediately after the intravenous injection of erepton or diphtheria toxin shows any increase in protein degradation products. If the whole blood is boiled, they can be recovered. When the addition is made to serum or blood *in vitro*, the degradation products can be recovered from the former, but from the latter only after boiling has destroyed the form elements. They are immediately adsorbed on the surface of the form elements. Immunization may involve, as a first step, this adsorption, since bacterial toxins would exhibit this. Subsequently added toxin would not be thus adsorbed and would therefore be promptly excreted.

GEORGE ERIC SIMPSON

#### H—PHARMACOLOGY

ALFRED N. RICHARDS

**Mechanism of the action of the nervi vagi and cardiac remedies.** HENRIJEAN. *Bull. acad. roy. med. Belg.* [5] 3, 228-39(1923).—The influence of Ca and K ions on the action of digitalin, strophanthin and similar drugs is studied in vivisection expts.

R. BEUTNER

**Insulin.** A. GRÆVENSTUCK, E. LAQUEUR AND W. RIEBENSAMM. *Nederland. Tijdschr. Geneeskunde* 67, 1, 1630-3(1923).—The authors have prepd. insulin by extrn. of very fresh pancreas with alc. according to the directions of McLeod and his co-workers. Their prepn. acts in the same way as that of McLeod, producing hypoglycemia and convulsions after subcutaneous injection in rabbits. No such action is observed after intravenous injection in rabbits, and no action at all in white mice. The prepn. were active after filtration through a Berkefeld filter. R. BEUTNER

**Further tests on chlorine as a preventive of influenza.** HARRISON HALE. *Ind. Eng. Chem.* 15, 746(1923).—Results favorable. Cf. *J. Ind. Eng. Chem.* 12, 806; also Gudeman, *C. A.* 14, 1412 and Baskerville, *C. A.* 14, 979. E. J. C.

**Physiological and pharmacological action of vitamins.** DOMENICO GANASSINI. *Arch. farm. sper.* 35, 104-12, 122-9, 139-44(1923).—Avitaminosis was produced in rats by feeding a ration of flour, linseed, hemp, rice, dried spinach and milk, which had been autoclaved 1 hr. at 130°. The rats failed to improve when the raw food was restored, but responded readily to subcutaneous injections of vitamin exts. in physiol. NaCl soln. Normal rats on the autoclaved ration plus 1/2 the vitamin ext. from the raw amt. of material showed the same gain in wt. as the control rats fed on the raw food. A. W. D.

**The effect of hypophysis extract on the stomach-intestine tract and on human blood.** H. GORKE AND E. DELOCH. *Arch. Verdauungskrankh.* 29, 149-63(1922); *Physiol. Abstracts* 7, 558-9.—Increased secretion of the salivary glands, liver (bilirubin and cholesterol), and pancreas, and a relative decrease of the stomach secretions follow, as a rule, subcutaneous injection of the ext. There is also an increase of tone and peristalsis in a large no. of subjects. The action of hypophysis ext. is twofold—a chem. effect, and an influence on the vegetative nervous system. The effect on the blood is to bring about a relative and abs. increase of leucocytes; the sugar content is very little influenced.

H. G.

**Effects of strychnine on the higher nerve centers.** II. B. BOUČEK. *Biol. listy* 8, 85-116(1922); *Physiol. Abstracts* 7, 616-17.—Other activities of the higher parts of the central nervous system are influenced by strychnine, in addn. to the corneal reflex already investigated. The effect appears to increase with the functional differentiation of cell structure, and also in the phylogenetic series the effect increases up to man. It is not known under what conditions a stimulating effect may go over to a paralytic one. B. has investigated the temp. influence.

H. G.

**The mode of action of atropine and eserine on the iris.** L. J. C. MITCHELL. *Med. J. Australia* 1, 664(1922); *Australia. Sci. Abstracts* 1, 28.—Atropine causes a dilatation of the pupil in a concn. of 1 in 50,000,000 and upwards; eserine causes a contraction of the pupil in a concn. of 1 in 10,000,000 and upwards, and evidence is adduced to prove that these drugs, when instilled into the conjunctival sac, do not reach the iris by the blood stream.

H. G.

**The action of collargol with special regard to the action of collargol constituents.** A. BÖRTNER. *Münch. med. Wochschr.* 68, 876-7(1921); *Abstracts Bact.* 6, 260.—Protective colloids injected intravenously produce a more lasting and stronger effect than do corresponding amts. of collargol. The effect produced by collargol is largely the effect of the protein component. Ag as such probably does not function, but the Ag-protein compd. is important therapeutically in two important points. It produces a non-sp. protein stimulation of the body; and it establishes certain depots in the reticulo-endothelial system so that the effect is extended over a period of time.

H. G.

**Glucolysis. The influence of hydrogen, calcium and mercury ions.** RUBINO AND VARELA. *Klin. Wochschr.* 2, 484-7(1923).—The glycolytic action of normal blood becomes nil when the  $p_H$  is suppressed to 6.37 by the addn. of HOAc or CO<sub>2</sub>. When CaCl<sub>2</sub> was added to normal defibrinated blood (Ca content 6 mg.%) the glycolytic activity steadily increased until 7 mg.% of Ca had been added. Further addns. of Ca decreased the glycolytic activity so that at a concn. of 310 mg.% glucolysis had ceased. A peculiar and unexplained break occurred in the curve at a Ca concn. of 35 mg.%. A HgCl<sub>2</sub> concn. of 0.5 g.% inhibits glucolysis completely. HgCl<sub>2</sub> concns. below 5 mg.% are without effect or may indeed augment glucolysis.

MILTON HANKE

**The influence of protein injections on the intermediate metabolism and the blood sugar.** HERMANN VOLLMER. *Klin. Wochschr.* 2, 529-32(1923).—The parenteral administration of foreign proteins leads first to a transitory acidotic phase (increased elimination of acid phosphates and an elevated urinary  $p_H$ ) and then to a marked alkalotic phase. The foreign protein at first reduces and then markedly increases intracellular oxidation. Sp. antigens, e. g. tuberculin, behave like any foreign protein in this respect. The hyperglucemic action of adrenaline is reduced when the adrenaline is injected after the alkalotic phase had been produced by the injection of a foreign protein.

MILTON HANKE

**The action of Rivanol.** ERNST BLOCH AND FRITZ SCHIFF. *Klin. Wochschr.* 2, 747(1923).—The bactericidal action of Rivanol is directly proportional to the concn. of Rivanol base in the soln. An aq. soln. of the hydrochloride is slightly acid in reaction and hence is less bactericidal than a soln. of Rivanol-HCl in serum which has a higher  $p_H$  than the aq. soln. Test expts. with const. Rivanol concns. and varying  $p_H$  showed an elevation of bactericidal power with a rising  $p_H$ . The addn. of serum to bouillon tends to change the  $p_H$  of the mixt. to that of the serum. Addn. of serum to an acid bouillon contg. Rivanol raises its power; but addn. of serum to an alk. bouillon contg. Rivanol reduces its bactericidal power.

MILTON HANKE

**Acetonuria in lye-poisoned children.** JULIUS VON GAIZLER. *Jahrb. Kinderheilk.* 101, 87-92(1923).—Acetone is always present in urine following lye poisoning in children, owing to resulting alkali necrosis and protein decompn.

I. NEWTON KUGELMASS

**The action of iodides on the viscosity of the blood.** G. DEUSCH AND B. FROWEN. *Deut. Arch. klin. Med.* 140, 377-80(1922).—The administration of NaI to 11 normal individuals caused a lowering of the viscosity of the blood in 73% and of the serum in 63.6%. The blood viscosity was increased in 9%, the serum in none. There was no

change in the blood in 18% and in the serum in 36.3%. The protein content of the serum was decreased in 27%, increased in 54.5% and no change in 18%.

JULIAN H. LEWIS

**The antiseptic action of some benzyl compounds.** D. I. MACHT AND JUSTINA H. HILL. *Bull. Johns Hopkins Hosp.* 34, 154-7 (1923).—The antiseptic action of the following substances was investigated, cultures of *S. aureus* being used: benzyl alc., benzaldehyde, benzyl benzoate and acetate, benzoïn, balsam of Peru, balsam of tolu and several others. All showed a germicidal and antiseptic effect, the most potent being benzyl alc. and benzaldehyde. The successful empirical use of a number of drugs contr. benzyl compds. is thus justified. The antiseptic power of benzyl alc. and benzaldehyde is much more powerful than that of some other drugs used as throat antiseptics such as menthol and guaiacol.

A. P. LOTHROP

**Effect of peptone shock on uric acid content of dog blood.** L. HEDON, CRISTOL AND NIKOLITCH. *Compt. rend. soc. biol.* 83, 852-4 (1923).—The uric acid of the plasma increases after an injection of peptone, and there seems to be a proportional increase in both the free and combined acid. In red cells the change is not so definite: in a few dogs the uric acid content diminished and in others definitely increased during the peptone shock.

S. MORGULIS

**Alteration in the currents and absorption of cerebrospinal fluid following salt administration.** F. B. FOLEY. *Arch. Surg.* 6, 587-604 (1923).—Intravenous administration of NaCl induces a decreased pressure in the subarachnoid space and ventricles of the brain, by causing absorption of water through the choroid plexus and the ependymal cells. It also causes direct absorption into the capillaries of the brain substance and the vessels of the subarachnoid space. It increases the rate of absorption along the sheaths of the cranial and spinal nerves. Thus the direction of flow in the aqueduct and ventricular system is reversed.

JOHN T. MYERS

**Domestic carbon monoxide poisoning from gas stoves.** E. R. HAYHURST. *Am. J. Public Health* 13, 462-5 (1923).

NATHAN VAN PATTEN

**Penetration of arsenic into the cerebrospinal fluid.** CARL VOEGTLIN, M. I. SMITH, HELEN DYER AND J. W. THOMPSON. *U. S. Public Health Repts.* 38, 1003-21 (1923).—The penetration of arsenic into the cerebrospinal fluid, following the intravenous injection of a variety of arsenicals, has been studied by (a) the chemical analysis of the blood, brain, and cerebrospinal fluid for the presence of arsenic, and (b) the parasitoidal action obtainable in the cerebrospinal fluid. The distribution of arsenic in various tissues and body fluids after injection of several preps. has also been studied. Normal rabbits fed on oats and kale contained 0.69 micromilligrams of As per g. of cerebral spinal fluid. The brain of normal animals contained an av. of 0.02 micromilligrams As per g. of fresh tissue. *Trypanosoma equiperdum* is killed in blood suspension *in vitro* by 7.5 micro-mg. of As from "arsenoxide," in 6 min. Arspenamine, neoarsphenamine, and silver arspenamine have a relatively low effectiveness unless very large doses are used. Sulfarsphenamine is the most effective arsenobenzene deriv. studied. A greater therapeutic effect can be expected from large single doses given at long intervals than from smaller doses administered more frequently. Sulfarsphenamine, tryparsamide, and 3-amino-4-hydroxyphenylarsonic acid are suggested as remedies of superior penetrative power.

GEORGE W. PUCHER

**Pharmacology of the brain.** C. AMSLER. *Arch. expl. Path. Pharm.* 97, 1-14 (1923).—The failure of elec. stimuli of the sciatic to inhibit the heart in animals treated with morphine is not an expression of vagal paralysis but is the result of an elective interference by the morphine in the prevagal part of the reflex. In the decerebrate animal the inhibitory action of "painful" stimuli is present as in normal animals. In one case the inhibition of the heart by small doses of morphine is prevented, in the other the reaction is not affected, thus indicating that neither curare nor morphine (in the amts. used) paralyzes the vagus. The vomiting induced by apomorphine is not a cerebral cortex reaction but is entirely subcortical, as are other involuntary actions. Expts. in rats, guinea pigs and pigeons show that the forced gnawing in rats and guinea pigs and the forced picking in pigeons are the result of stimulation of the corpora striata. These involuntary reactions and vomiting are not equiv. processes. Small doses of apomorphine in these animals do not stimulate the motor ganglia of the thalamus. The stupefaction following large doses of apomorphine in normal and decerebrate animals differs; the former are without reflexes in the apomorphine narcosis, the latter show reflex irritability to "painful" stimuli. The convulsions which follow the administration of large doses of apomorphine are due to effects upon the cerebral cortex.

G. H. S.

**Influence of adrenaline and ergotamine on diuresis in the dog with a bladder**

**fistula.** ALFRED ARNSTEIN AND FRITZ REDLICH. *Arch. expil. Path. Pharm.* **97**, 15-92 (1923).—The subcutaneous injection of adrenaline or ergotamine causes a significant inhibition of water or saline diuresis in the dog with a bladder fistula. This inhibition is not due to derangement in resorption. The inhibition is removed by such potent osmotic agents as urea or  $\text{Na}_2\text{SO}_4$ . Ergotoxin intensifies, rather than reduces, the inhibition due to adrenaline. The effect of adrenaline may be due either to mechanical causes, as a continued action upon the contractile elements of the blood and lymph capillaries, or to physicochem. causes leading to a retention of the water. G. H. S.

**Local application of strychnine to the spinal cord.** S. DE BOER. *Arch. expil. Path. Pharm.* **97**, 30-7 (1923).—With only intoxication of the dorsal portion there is a partial intoxication of the intermediary neurones, and in both dorsal and ventral intoxication both the entire intermediary neurones and all of their collaterals and terminal branches are involved. G. H. S.

**Pharmacological action of the three stereoisomers of camphor and of some camphor derivatives on smooth muscle.** MAX DOHRN. *Arch. expil. Path. Pharm.* **97**, 38-50 (1923).—All 3 stereoisomers of camphor have a paralyzing action on smooth muscle, the *l*-camphor being somewhat more active than the *d*-camphor. Because of its content in both the *l*- and *d*-modifications the racemic synthetic camphor occupies a position intermediate between the two forms in so far as its action on smooth muscle is concerned. The aminocamphors are less active. Among the urea derivs. activity is directly dependent upon the constitution of the compd. Hydroxymethylcamphor is highly toxic, and its action, differing from that of all other camphor derivs., is not reversible. Camphorylurea and camphorylpseudourea were both active, the first causing an increased tonus. Camphorylpseudo-semicarbazide was inert. With dicamphorylurea paralysis occurred promptly. G. H. S.

**Action of alkaline earths on the electrocardiogram of normal rabbits and of rabbits intoxicated with oxalate.** A. FRÜHLICH AND R. GUSSENBAUER. *Arch. expil. Path. Pharm.* **97**, 61-78 (1923).—The electrocardiograms of rabbits injected intravenously with Ca, Ba, and Mg are compared with similar tracings secured from rabbits intoxicated with oxalic acid.  $\text{BaCl}_2$  was inactive after a previous injection of Ca or Sr. Ca showed but little effect when given after Ba or Sr. Mg did not protect against a subsequent injection of Ca. G. H. S.

**Relative potencies of chloroform and carbon tetrachloride.** HERMANN FÜHRER. *Arch. expil. Path. Pharm.* **97**, 86-112 (1923).—After internal administration  $\text{CHCl}_3$  caused narcosis in rabbits, but only when lethal doses were given. Given internally  $\text{CCl}_4$  causes death, but no narcotizing action is manifest even when administered in 10 times the lethal dose. Administered subcutaneously to white mice both compds. show certain effects in common, although here again only  $\text{CHCl}_3$  has a narcotic effect. By inhalation  $\text{CHCl}_3$  is more active for mice and frogs than is  $\text{CCl}_4$ , but in narcosis expts. on frogs with aq. solns. the effects are reversed. Quant. detns. show that by inhalation mice and frogs absorb less  $\text{CCl}_4$  than  $\text{CHCl}_3$ , so that the weaker action of the former is in part explained.  $\text{CCl}_4$  is less active on the brain and nervous system than is  $\text{CHCl}_3$ . G. H. S.

**Pharmacology of the stereoisomers of cocaine.** R. GOTTLIEB. *Arch. expil. Path. Pharm.* **97**, 113-46 (1923).—There is an obvious parallelism between the relative fat soly. of the various cocaines and their anesthetic actions. If the isomers are arranged in the order of their increasing anesthetic action the oil soly. for the compds. follows the same general series. A similar relation is noted between the oil soly. and pharmacol. activity of benzoyltropeine and tropacocaine. *l*-Cocaine has a satn. concn. in oil of 5%, *dl*-cocaine of 14%, *dl*- $\psi$ -cocaine of 11%, and *d*- $\phi$ -cocaine of 33%. The satn. concn. for benzoyltropeine is 8%, that for tropacocaine is 25% and the latter is from 3 to 4 times as active. G. H. S.

**Action of squill on the isolated frog heart.** H. F. GRÜNWALD. *Arch. expil. Path. Pharm.* **97**, 156-70 (1923).—The action of squill on the isolated frog heart resembles that of strophanthin, being characterized by a retardation of the ventricle, conduction disturbances, frequently with a halving of the pulse, and finally a cessation in a mid position or rarely in systole. The effect of squill is not intensified by Ca. In Ca-free Ringer soln. squill is active, and it restores the activity of the heart when almost inactivated by long exposure to Ca-free Ringer soln. Squill may inhibit, or prevent, Ca contraction. Between strophanthin and squill there is a pseudoantagonism, in that with the combined use of both substances the appearance of the strophanthin contraction is inhibited, or an existing strophanthin contraction is removed. In K-free Ringer soln. squill causes a contraction, which is abolished by Ca-free Ringer soln. K and squill are not antagonistic. G. H. S.

**Action of strophanthin on the frog heart under different conditions.** HANS HANDOVSKY. *Arch. expl. Path. Pharm.* 97, 171-82(1923).—Perfusion expts. show that the heart functions better with iodide and thiocyanate mixts. than in Ringer soln.; with sulfate mixts. it acts very sluggishly, usually not at all. Strophanthin acts in just the same way in iodide, thiocyanate and sulfate mixts. as it does in Ringer soln. The effect of strophanthin on the sec.-vol. is intensified if the heart has received a previous treatment with NaI, and in NaI-strophanthin mixts. there is at times an apparent summation of the I and strophanthin effects. G. H. S.

**Pharmacology of the mucosa of the uterus.** ROBERT JOACHIMOVITZ. *Arch. expl. Path. Pharm.* 97, 202-8(1923).—The ingestion or parenteral injection of large amts. of salicylic acid or NaI is followed by the appearance of small amts. of these substances in the secretion of the uterus. G. H. S.

**Action of pilocarpine and atropine upon striated muscle.** O. LOEWI AND J. SOLT. *Arch. expl. Path. Pharm.* 97, 272-84(1923).—Pilocarpine and atropine have an effect upon the normal activities of striated muscle, the first in a concn. of 0.2%, the latter in a concn. of 0.02% and higher. They are not antagonistic, and their actions differ according to the ion content of the medium. In Ringer soln. the height of contraction is definitely, although not greatly, increased. In Ca-free solns. irritability undergoes a gradual loss up to complete inaction; this is counteracted by the addition of Ca and activity is restored to normal. Vratrine action is abolished by pilocarpine or by atropine. The action of pilocarpine is not a sensitization for K. In K-contg. NaCl soln. the permeability for  $P_2O_5$  is less, in Ca-contg. NaCl soln. it is greater than in pure NaCl soln. In saline soln. contg. pilocarpine or atropine the permeability for  $P_2O_5$  is likewise less than in pure NaCl soln. These permeability changes do not, however, furnish any explanation for the effects observed. Also in *Klin. Wochschr.* 1, 2046 (1922). G. H. S.

**Analysis of the vascular effects of pituitrin.** HANS MAUTNER AND E. P. PICK. *Arch. expl. Path. Pharm.* 97, 306-16(1923).—Pituitrin diminishes the liver vol. in dogs, cats and rabbits by a contracting action upon the splanchnic vessels. In dogs and cats along with the diminution in vol. of the liver there is a simultaneous initial fall in blood pressure; in rabbits the blood pressure is immediately increased very considerably. The difference in blood-pressure curves depends upon the fact that in dogs and cats the histamine contained in the pituitrin causes a congestion in the liver veins which is lacking in the rabbit. Repeated injection of pituitrin into dogs and cats does not modify the ability of the histamine component to cause a fall in blood pressure while the effects upon shrinking of the liver and the subsequent increase in blood pressure gradually become less pronounced. Apparently the active pressor component of pituitrin loses its original effect with repeated injection, while the other component remains entirely active. G. H. S.

**Non-susceptibility of the toad heart to the contracting action of digitalis.** O. LOEWI. *Arch. ges. Physiol.* (Pflüger's) 198, 359-66(1923).—Continued treatment of the frog heart with Ca caused it to react to digitalis as does the toad heart. G. H. S.

**Pharmacology of body position and the labyrinth reflex. IX. Oleum chenopodii.** R. MAGNUS. *Arch. ges. Physiol.* (Pflüger's) 198, 427-8(1923).—In chenopodium intoxication of rabbits the labyrinth position reflex and the vertical deviation of the eyes are lost, while the power of rotation is preserved. G. H. S.

**Examinations of the blood of persons handling radium and Röntgen rays.** P. AMUNDSEN. *Tids. Norske Lægeforening* 42, 862-70(1922).—The blood of 15 physicians, students of medicine and nurses, who had been more or less exposed to Ra or Röntgen rays, all had a hemoglobin content somewhat above the normal. The color index was normal and no anemia (erythrocytopenia) was observed. The number of white blood corpuscles were not decidedly abnormal, but in the av. somewhat low. The increased ratio between lymphocytes and leucocytes is noticeable. The first influence of the Ra or Röntgen rays is a very brief leucocytosis, followed by a leucopenia which acts against the lymphocytes. These are regenerated more rapidly than they are destroyed, and so the lymphatic leucemia, which has appeared among some radiologists, may probably be explained as a too rapid regeneration of lymphocytes. Many of the common means of protection may be unreliable, for instance the new Coolidge-tubes. CHR. H. A. SYVERTSEN

**Diffusion and localization of pyramidone.** RÉMY PROUZERGUE. *J. pharm. chim.* 27, 372-4(1923).—A chem. report on 2 fatal cases where by mistake 30 g. instead of 0.30 g. of pyramidone (A) were ingested. Death ensued after 1 to 2 hrs. A was detected in the viscera by extg. with warm  $H_2O$  and applying the color tests with 10%  $FeCl_3$  and with 10%  $K_2S_2O_8$ ; org. liquids (blood, urine, etc.) were first pptd. with Pb



subacetate, then with  $\text{Na}_2\text{SO}_4$ . Colorimetric detns. were made with 1%  $\text{FeCl}_3$  soln., 1%  $A$  soln. being used for comparison. No  $A$  was found in the brain and lungs, but it occurred slightly in the heart and blood, more of it in the spleen, kidneys and pancreas; rather strongly in the liver, more so in the intestine, very strongly in the stomach.  $A$  as such was absent in the urine of the bladder, but was replaced by much *antipyrine*.

S. WALDBOTT

**Deposition and subsequent course of particulate material (manganese dioxide and manganese metasilicate) administered intravenously to cats and to rabbits.** C. K. DRINKER, L. A. SHAW AND KATHERINE R. DRINKER. *J. Exptl. Med.* **37**, 829-50 (1923).—Suspensions of  $\text{MnO}_2$  given intravenously to the cat are virtually eliminated from the body in 1 week. As this process goes on, there is a transfer of Mn from lungs to liver. Similar suspensions of  $\text{MnO}_2$  given intravenously to rabbits are excreted more rapidly, the whole process of removal from the blood being carried on by the liver. Three different suspensions of rhodonite ( $\text{MnSiO}_3$ ), varying in the size of the largest particles from 1.3 to  $0.2\mu$ , when injected intravenously into cats show a greater and greater tendency towards arrest in the liver as the size of the individual particles becomes smaller. When suspensions contg. particles averaging  $1.1\mu$  in diam. are injected intravenously into cats, the primary sites of deposition are similar to those observed for  $\text{MnO}_2$  suspensions. The disappearance is exceedingly slow and is apparently completed in about 50 days. Rhodonite should prove a suitable substance with which to attempt the production of lung fibrosis in cats through the medium of intravenous injection. A method is given for the *detn.* of rhodonite in animal tissues. C. J. WEST

**Arsenical compounds in the treatment of blackhead in turkeys.** H. B. TYZZER. *J. Exptl. Med.* **37**, 851-73 (1923).—Neoarsphenamine injected intravenously in toxic doses has a somewhat favorable effect on the course of the spontaneous disease and evidently lowers the mortality. Less favorable results were obtained with atoxyl.  $\text{As}_2\text{O}_3$  fed daily in small doses failed to prevent blackhead and possibly increased the incidence of infection. In larger doses it failed to cure spontaneous blackhead. Trypsinamide may be injected in cases of spontaneous blackhead in doses as high as 1 g. per kg. of body wt. without serious toxic effect. Prompt clinical improvement usually follows and the mortality is undoubtedly greatly lowered. With inoculated blackhead, recovery is more difficult to obtain. Either intravenous or subcutaneous injection of appropriate doses of trypsinamide at the 1st appearance of symptoms should serve to cure the majority of cases of blackhead. C. J. WEST

#### I—ZOOLOGY

R. A. GORTNER

**The zinc content of certain invertebrate organisms.** GABRIEL BERTRAND AND R. VLADESCO. *Bull. soc. chim.* **33**, 341-5 (1923).—The Zn content of a number of invertebrates of the oyster and mollusc species was detd. by the method previously described (*Bull. soc. chim.* [4] **29**, 53 (1921); cf. *C. A.* **15**, 397). The Zn varied considerably in different parts of the same organism and no definite conclusion could be drawn other than that it seemed to play an important part in fecundation. T. S. CARSWELL

**Hydrolysis of the whole body of carps.** YUZURU OKUDA AND SHINKICHI MATSUDA. *J. Sci. Agr. Soc. (Japan)* No. **248**, 337-41 (1923).—*Cyprinus carpio* is a most common fresh water fish cultured in Japan. To throw some light on the selection of proper kind of protein food fed, O. and M. have hydrolyzed the whole body of the fish. Six living carps in winter sleep (total 1944 g. and with no food residue in their alimental canals) were boiled with 1 l. of  $\text{H}_2\text{O}$  and 200 cc. of concd.  $\text{H}_2\text{SO}_4$  and the distribution of N was detd.:

		In fish body (%)	In total N (%)
$\text{H}_2\text{SO}_4$ -sol.	N	2.58	97.0
in which,	Humic N	0.29	10.8
	Ammonia N	0.06	2.3
	Org. base N	0.58	21.8
	Monoamino acid and other N	1.65	62.1
	Purine N	0.04	1.5
	Arginine N	0.23	8.6
	Histidine N	0.17	6.4
	Lysine N	0.11	4.1
$\text{H}_2\text{SO}_4$ -insol.	N	0.08	3.0

The following substances were isolated from 1944 g. of the fish body: Glycine 2.0, alanine 5.7, valine 5.7, leucine 8.0, proline 10.5, phenylalanine 3.9, aspartic acid 0.9, glutamic acid 12.9, serine +?, tyrosine 3.5, arginine 14.0, histidine 12.3, lysine 11.3.

ammonia 1.4 g. and tryptophan + . The content of histidine in the fish body is much larger than that of fish muscles.

**The distribution and significance of iron in animal organisms.** K. KASHIMA. *Sitzb. preuss. Akad. Wiss.* 22-3, 294-8(1922); *Physiol. Abstracts* 7, 593.—A summary. Porifera, Coelenterates, Echinoderms, worms, Crustacea, Mollusca, tunicates, and fishes are examd. and a description is given of the distribution of Fe which is found throughout; methods (micro- and macro-) are also detailed. The function of iron is not only respiratory, but also "accumulatory," as in the liver, and mech. as in the teeth, cuticles, etc.

**The nature of the determining factors in regeneration.** J. W. BUCHANAN. *J. Exptl. Zool.* 37, 395-416(1923).—The effect of chloretone and  $\text{Et}_2\text{O}$  on regenerating pieces of *Planaria dorolcephala* is given. Chloretone is an effective general protoplasmic depressant;  $\text{Et}_2\text{O}$  is not. There are other physiological considerations.

**The contractile vacuole in Euplotes: An example of the sol-gel reversibility of cytoplasm.** C. V. TAYLOR. *J. Exptl. Zool.* 37, 259-89(1923).—Largely biological. Coalescence of vacuoles involves a reversion of their boundaries from the gel to the sol condition.

Composition of the coral of Tirreno (PASSERINI) 8.

## 12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

**Some observations with regard to the unsaponifiable matter and sterols of edible fats.** D. W. STEUART. *Analyst* 48, 155-60(1923).—The % sterol in the unsaponifiable matter was detd. by the digitonin method on various animal and vegetable fats and the m. ps. of the sterol acetate are given. An examn. of the sterol prep. from a sample of fat will show definitely whether the fat is of purely animal origin or whether vegetable fat is present. Sterol acetate examn. cannot be used to demonstrate the presence of animal fats in mixts. contg. vegetable oils. Examn. of the oil from a sample of com. lecithin showed that not more than 8% of the *lecithin* of the oil could have been present in the unsaponifiable matter.

**The fat content of foods and soaps.** M. MONHAUPT. *Z. Nahr. Genussm.* 45, 120(1923).—A comparison of previously published methods. Cf. *C. A.* 6, 658; 17, 596, 834.

**Further contributions to the determination of fat in foods and soap.** J. GROSSFELD. *Z. Nahr. Genussm.* 45, 147-52(1923); cf. *C. A.* 17, 834.—Some modifications of the original method are suggested. With such products as butter, cocoa and the like, complete extn. with trichloroethylene is obtained with no heat or with just enough to melt the fat. After extn. of 10 g. of butter with 100 cc. of trichloroethylene, the water phase may be entirely removed by adding 5-10 g. of gypsum. The fat soln. may then be filtered and an aliquot dried. For measuring this aliquot a 25 cc. pycnometer is better than a pipet. Ten cc. of trichloroethylene are used to rinse out the pycnometer. When turbidity in the water phase develops it may be removed by adding a pinch of kieselguhr and shaking. Nearly all the solvent may be recovered from the fat soln. by distn. over a free flame. Final drying for 1 hr. at  $105^\circ$  is then necessary.

**Determination of fat in egg yolk.** Fr. KÜHN. *Collegium* 1923, 56-7.—The sample is treated successively with  $\text{H}_2\text{O}$ ,  $\text{NH}_4\text{OH}$  and  $\text{EtOH}$ , in a Rose-Cottlieb cylinder, and extd. with  $\text{Et}_2\text{O}$  and petroleum ether. The ethereal ext. is free from boric acid.

**Composition of imitation "pecorino romano" cheese.** G. FASCETTI. *Ann. ist. sper. Caseificio Lodi* 1922, 3; *Bull. Agr. Intelligence* 13, 1157-8.—The chemical analysis of spurious "pecorino" gave: water 31.50, fats 26.60, nitrogenous substances 30.51, ash 11.39%. The analysis of the degree of fermentation gave: total N 5.010, sol. N 1.275, albuminose N 0.225, peptone N 0.289, amino N 0.306, ammoniacal N 0.017%. The Roman "pecorino" differs from its imitations in having a high proportion of fats and  $\text{NH}_3$ . According to Sartori's analysis, its dry matter contains from 0.117 to 0.157% of  $\text{NH}_3$  and between 41 and 45% of fats.

**Importance of the quality of rennet in the manufacture of cheese.** L. PRYIT. *Lacta* 1, 25(July 1920).—The qualities required of rennet are: uniform strength, should not deteriorate with age, should contain no pepsin, fermentable org. matter, antiseptics ( $\text{H}_2\text{BO}_3$ , alc.), nor casein precipitants (mineral or org. acids).

**Case of abnormal fermentation in cheese making.** E. VAILLANT. *Lacta* 1,

16(Sept. 1920).—A case of fermentation of cheese causing swelling and formation of a large no. of holes was traced to the presence of a yeast which fermented lactose to alc. Special precautions to ensure thorough asepsis prevented its recurrence.

**Ropy milk.** H. R. BREDDO. *Lacta* 1, 16-7(July 1920).—A description of ropy milk, its causes and its prevention. A. PAPINEAU-COUTURE

**Use of hydrogen peroxide in the dairy industry.** ANON. *Lacta* 2, 15-7(June 1921).—The preservation of milk to be pasteurized can be effected by means of 0.1% of  $H_2O_2$ , which can be increased to 0.2-0.3% in stormy weather. The  $H_2O_2$  is preferably added at the farm or by the carter collecting the milk. A. PAPINEAU-COUTURE

**The preservation of dairy products.** E. BURBAN. *Lacta* 1, 10-1(May 1920).—Brief discussion of the use of preservatives, pasteurization and refrigeration for the preservation of milk and butter. A. PAPINEAU-COUTURE

**Foot and mouth disease and milk.** L. PANISSET. *Lacta* 1, 14(May 1920).—Brief description of the effects of foot and mouth disease on the amt. of milk secreted and on its compn., showing its danger to both animals and man. A. P.-C.

**By-products and residues of the dairy industry.** ANTONIN ROLET. *Lacta* 3, 10-2(Nov. 1922).—Brief description of the utilization of skimmed milk, whey, and butter-milk. A. PAPINEAU-COUTURE

**Minimum chemical control in the dairy industry.** E. BURBAN. *Lacta* 1, 14-6(June 1920).—An outline of the proper control of dairies from a chem. standpoint. A. PAPINEAU-COUTURE

**Milk and the function of the dairy industry in nutrition in the future.** E. BURBAN. *Lacta* 1, 12-4(July 1920).—Brief description of the constitution of milk and its function in nutrition. A. PAPINEAU-COUTURE

**The effect of the spray process of drying on the vitamin-C content of milk.** G. W. CAVANAUGH, R. A. DUTCHER AND J. S. HALL. *Am. J. Diseases Children* 25, 498-502(1923).—The spray process of drying milk preserves in its original strength the vitamin C, i. e., the antiscorbutic properties of milk. I. NEWTON KUGELMASS

**Simple and rapid method of testing the condition of milk.** E. VAILLANT. *Lacta* 3, 15(June 1922).—Shake together equal parts of milk and of 67% alc. If the milk clots, it is about to curdle; if it adheres to the wall of the test-tube in long, white, viscous streaks it can stand a journey of at most 4-5 hrs.; if the mixt. remains liquid and homogeneous the milk is in a proper state of preservation. A. PAPINEAU-COUTURE

**The diphenylamine reaction in milk.** WILHELM HARTMANN. *Z. Nahr. Genussm.* 45, 153-4(1923).—The diphenylamine reaction for nitrates is sometimes used for detection of added water in milk. Previous investigations on the presence of nitrates in milk as a result of saltpeter feeding are discussed. Cf. C. A. 6, 517; 11, 1492. D. B. DILL

**The determination of phosphoric acid in milks and its application to the detection of watering.** A. KLING AND A. LASSIEUR. *Ann. fals.* 16, 141-6(1923).—As the total  $P_2O_5$  content of milk does not change when the sample is considerably decomposed, it is well suited to the detection of watering if there is a control sample of known purity of the same milk. K. and L. use Copaux's method (C. A. 16, 219), which can be carried out in about 20 min. and has an accuracy of 1%. Detns. on artificial mixts. having approx. the same compn. as milk solids showed there was no loss of  $P_2O_5$  on ashing in the usual manner. A. PAPINEAU-COUTURE

**Is fibrin to be found in normal cow milk?** E. HEKMA. *Tijdschr. vergelijk. Geneeskunde* 8, 276-308(1923).—Comparison of the microscopic fibers, found in the coagulum of milk, with the fibrin fibers of blood-plasma by staining with Weigert's method, showed that the two kinds of fibers are different. Normal milk does not contain fibrin. R. BEUTNER

**The seasonal variations of the percent of fat in cow milk.** A. C. RAGSDALE AND C. W. TURNER. *J. Dairy Sci.* 5, 544-54(1923).—Data are presented showing the seasonal variations of fat in cow milk, derived from a study of 3763 Guernsey, 299 Jersey, and 95 Holstein-Friesian yearly records. The fat content follows a general curve, being lowest during summer, then gradually increasing, reaching a peak during the winter months, then again declining. Changes of temp. which accompany different seasons have greater influence upon the % fat than the advance of lactation. In general no matter when the lactation period begins there is a tendency for the % fat to rise during the winter months. C. A. 10, 1810. O. L. EVENSON

**Hemolytic streptococci in high-grade milks.** W. D. FROST AND F. M. BACHMANN. *Am. J. Pub. Health* 13, 300-2(1923). NATHAN VAN PATTEN

Comparative study of mediums for the quantitative estimation of bacteria in milk.

MARTIN FROBISHER, JR. *Am. J. Pub. Health* 13, 474-8(1923).—The mediums selected for study were (1) medium of the Am. Pub. Health Assoc., (2) lactose agar, (3) milk-powder agar, (4) milk-powder-yeast agar, (5) milk-powder agar with the addition of 1% lactose. All of the enriched mediums give in general a higher count than the present standard medium. Colonies on all the enriched mediums are larger, more uniform in size, and more regular in appearance than on the standard agar. The lactose-agar is as uniform in compn. as the present standard agar. All of the enriched mediums make possible a differentiation of bacterial species. A bibliography is given.

NATHAN VAN PATTEN

**The fat-free dry residue of buttermilk.** F. H. VAN DER LAAN. *Tijdschr. vergljk. Geneeskunde* 8, 278-5(1923).—The dry residue is sometimes lower than the Codex standard figure when the buttermilk is not thoroughly mixed before it is sampled for analysis.

R. BRUTNER

**Specific gravity of the serum of diluted buttermilk.** F. LANTERWALD AND J. SINGER. *Molkeri-Zig.* 36, 1427-8(1922); *Bull. Agr. Intelligence* 13, 1397-8.—The sp. gr. of the serum of undiluted buttermilk varies between 1.020 and 1.028 at 15°. 1.026 therefore is taken as the minimum sp. gr. and the quantity of water added is deduced by calcul. from the ascertained sp. gr. The writers have calcul. the sp. gravities for dilns. with water in quantities increasing by 0.4 or 0.5% from 4 to 104.7%. They compared the figures thus obtained with those given by serum diluted with different percentages of water and found that the calcul. figures exceeded those obtained by actual measurements by very small quantities; these differences have no practical disadvantage and are, moreover, fully compensated for by the fact that 1.026 is taken as the sp. gr. of the serum of buttermilk whereas it is really on the av. 1.028.

H. G.

**The biochemical and biological qualities of goat milk.** F. CORDUS. *Z. Ziegenzucht* 22, No. 1, 1-3(1921); *Bull. Agr. Intelligence* 12, 915.—The fat content of different goats varied between 2.72 and 4.11%. The fat content of the morning milk is 3.29%, that of the mid-day milk 4.19% and that of the evening milk 3.94%. The degree of acidity detd. by the Soxhlet-Henkel method showed great variations, the av. figure being 4.7 degrees of acidity. The detn. of the catalase gave results showing considerable differences, the av. being 2.25. The figure of catalase increased with the age of the goats. The diastase estd. by Konings' method showed a marked difference between the morning and evening milk. No influence of the period of lactation on the diastase content was noticed.

H. G.

**The production, composition and utilization of whey.** R. A. BERRY. *J. Agr. Sci.* 13, 193-239(1923).—The production and utilization of whey are treated from the statistical standpoint. The chem. data given under the heading of compn. of whey are voluminous and detailed.

R. B. DEEMER

**Bellier's reaction in butter.** OSKAR STEINER. *Z. Nahr. Genussm.* 45, 154-6(1923).—Bellier's reaction is useful in detecting sesame oil in butter. It is of little value in detecting other plant fats.

D. B. DILL

**Vitamin B in the edible tissues of the ox, sheep and hog.** I. Vitamin B in the voluntary muscle. II. Vitamin B in the edible viscera. RALPH HOAGLAND. U. S. Dept. Agr., *Bull.* 1138, 1-46(1923).—The lean meat of pork is rich in vitamin B, comparing favorably in this respect with liver and kidney, organs heretofore recognized as containing an abundance of this vitamin. Beef appears to contain a much smaller proportion of the vitamin while mutton occupies an intermediate position. Several of the internal organs are particularly rich in vitamin B. The heart appears to be the richest in this vitamin, but the liver and kidney have only slightly lower values. The other organs contain smaller quantities of the vitamin.

W. H. ROSS

**Investigation of the working action of baking powder.** J. TILLMANS AND A. GÜRTTLER. *Z. Nahr. Genussm.* 45, 102-12(1923).—Common types of baking powder were studied. The time in which the available CO<sub>2</sub> was liberated at various temps. was detd. A mixt. of KH tartrate and NaHCO<sub>3</sub> liberates at room temp. 2/4 of its CO<sub>2</sub> in 5 min. and the rest in the next 15 min. Baking expts. showed this to be the best type. A mixt. of CaHPO<sub>4</sub> and NaHCO<sub>3</sub> was similar in action although only about 2/3 of the CO<sub>2</sub> was released soon enough to be of leavening power. Baking powders contg. tartaric acid, KH<sub>2</sub>SO<sub>4</sub> or Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> with NaHCO<sub>3</sub> liberate their CO<sub>2</sub> too rapidly and produce large holes in the cake. On the other hand when the CO<sub>2</sub> is completely liberated only at high temps. there is a similar result.

D. B. DILL

**Alimentary value of some Indo-Chinese Leguminosae.** R. PRUDHOMME. *Bull. mens. inst. nat. agr. coloniale* 6, No. 50, 33-41(1922); *Bull. Agr. Intelligence* 13, 494-5.—Purple dolichos (*Dolichos* var. undetd.), French bean (*Phaseolus radiatus*), spotted dolichos (*D. tonkinensis*) and cowpea (*Vigna sinensis*), resp., contain H<sub>2</sub>O 11.98, 12.10

11.02, 12.14; ash 2.86, 3.12, 3, 3.08; fat 1.10, 0.64, 1.34, 1.14; nitrogenous substances 24.08, 25.40, 23.35, 24.5; sacchariferous substances 41.8, 42.86, 38.30, 43.36; crude fiber 6.72, 7.84, 8.96, 7.92%. All these can be used for human food. The French bean is most suitable.

E. H.

**The chemical composition of mangels. Analyses made in New South Wales.** A. A. RAMSAY. *Agr. Gaz. N. S. Wales* 32, Pt. II, 819-21 (1921); *Bull. Agr. Intelligence* 13, 336.—The mean compn. of the mangel is moisture 92.01, albuminoids 0.99, ether ext. 0.04, fiber 0.77, ash 1.37, N-free ext. 4.80. The percentage compn. of the dry matter content is albuminoids 7.41-22.26, ether ext. 0.16-0.99, fiber 2.28-18.86, ash 6.74-36.38, N-free ext. 32.04-83.40%.

H. G.

**Experiments in drying green peas.** M. MESSINA. *Riv. di Agr.* 26, 384-6, 396-8 (1921); *Bull. Agr. Intelligence* 12, 1333-4.—Peas that have been dried when quite ripe, i. e., when they have turned yellow, are little in demand, because they are indigestible, and because they are often attacked by *Bruchus pisi*. If they are dried while still green and immature, they are most digestible and nutritious, and still retain to a great extent their original flavor and tenderness. According to analyses made by Payen, the compn. of dried yellow and green peas, resp., is: starch, dextrin and sugars 58.7 and 53.5, nitrogenous matter 23.8 and 25.4, fats 2.1 and 2.0, crude protein 3.5 and 1.9, salts 2.1 and 2.5, hygroscopic water 8.3 and 9.7%.

H. G.

**The banana plant.** P. DE SORNAV. *Rev. agr. Maurice* 1, No. 7, 15-9 (1923).—Analyses are given, from the food standpoint, of the peel and pulp of green and ripe bananas, and of banana flour; also the amt. and compn. of the ash of the leaves and main stem. The latter figures show that the fertilizer requirements of the plant are low.

F. W. ZERBAN

**Sweet potato. II. Chemical composition and comparative analyses of tubers.** C. I. JURITZ. *J. Dept. Agr. Union S. Africa* 2, 340-52 (1921); *Bull. Agr. Intelligence* 12, 843-7.—The av. compn. of the sweet potato according to a series of analyses of tubers from different countries is as follows:

Principal constituents.	Av. for 12 series. (1).	United States. (2).	England. (3).	Japan. (4).	Azores. (5).	Malaga. (6).
Water	71.86%	73.39%	70.98%	76.19%	86.45%	69.10%
Protein	1.00	1.28	0.92	2.81	0.39	1.20
Fat	0.20	0.28	0.49	0.12		
N-free ext.	25.05	—	—			
Gum, etc.	—	1.08	2.39	3.11	12.12	27.06
Sugar	—	6.86	2.69			
Starch	—	15.06	20.26			
Fiber	1.03	0.98	1.20	1.79	0.49	1.32
Ash	0.86	1.07	1.07	1.17	0.55	1.32

Analyses of sweet potatoes cultivated in S. Africa are also given.

H. G.

**Sunflower growing in Rhodesia.** C. MAINWARING. Dept. Agr. Salisbury, Rhodesia, *Bull.* No. 423, 8 pp. (1922); *Bull. Agr. Intelligence* 13, 1122.—An analysis of the air-dried leaves of Rhodesian sunflowers gave the following figures: water 14.87 (78.73% for fresh gathered leaves), ether ext. 2.82, protein 16.50, carbohydrates 42.15, crude fiber 7.87, ash 15.79%. The corresponding figures for U. S. sunflower leaves were resp.: 12.51, 4.09, 10.15, 38.83, 13.16, 21.26%. Thus the Rhodesian sunflowers were over 62% richer in protein and 47% lower in crude fiber and 31% lower in fat than the American. After the removal of the seeds the Rhodesian sunflower heads gave on analysis: water 11.73, ether ext. 3.18, protein 8.86, carbohydrates 46.42, crude fiber 18.19, ash 11.6%. For U. S. sunflower heads the corresponding figures were resp.: 7.40, 5.07, 9.91, 39.79, 18.44, 19.39%. The oil is used for the table and also for general com. purposes. It is claimed to be superior to most oils for soap-making.

H. G.

**Determination of different acids in fruit juices and foods.** GUNNER JORGENSEN. *Ann. fals.* 16, 153-66 (1923).—J. reviews and describes in detail the methods which he found most satisfactory for the detn. of  $H_2BO_3$ ,  $P_2O_5$ , tartaric, citric, malic and oxalic acids,  $BzOH$ ,  $HCO_2H$ , and free mineral acids (in vinegar). None of the methods are new.

A. PAPINEAU-COUTURE

**A differential index of dissociation of organic acids. Its application to the examination of fruit juices and beverages, and interpretation of the results.** R. GOIFFON AND F. NEPVEUX. *Compt. rend. soc. biol.* 87, 1109-10 (1922).—Treat 100 cc. of soln. with powdered  $Ca(OH)_2$  and filter after 15 min. Neutralize 25 cc. of the filtrate to phenolphthalein with  $HCl$ ; add 5 cc. of 0.02% orange IV and adjust the reaction with

HCl to  $p_H$  2.7. Treat another sample similarly but adjust the reaction to a  $p_H$  4 using methyl orange. The ratio of the 2 values gives the relative amts. of strong and weak organic acids present. Thus, ripe water-melon juice, with a differential index of 39, and its organic acids are fairly strong; for tomatoes 60; lemons 83 with very strong acid content. Data are also given for various samples of white wines. S. MORGULIS

**Moskonfyt.** S. W. VAN NIEKERK. *J. Dept. Agr. Union S. Africa* 6, 315-9 (1923).—Moskonfyt is the S. African name for a grape sirup prepd. by boiling the partially clarified must, with const. stirring, for 3 or 4 hrs. in a Cu or Fe pot. A sugar concn. of 68 to 69%, corresponding to sp. gr. 1.34 to 1.345 and b. p. 107.5° to 107.8°, is necessary to prevent fermentation and crystn. The sugar concn. can be detd. by the use of a sp. gr. bottle or by the b. p. of the sirup. Reduction of the acidity of the must to 3-4.5% before concn., with approx. 3.2 g. of 75% ground limestone per l., gave a sirup of pleasing taste and color. By first fermenting about 5% of the sugar out of the must a sirup contg. as much as 72% of sugar may be prepd. in which very little crystn. occurs. The work is being continued. K. D. JACOB

**Coffee culture.** J. HAGEN. *Tropical Agr.* 59, 269-75 (1922).—The caffeine contents of 9 kinds of coffee are given, a variation of from 0.83 to 1.37% being shown. Analyses of roasted and unroasted coffee indicate that marked changes take place during roasting but that the constituents are not dissipated. There is a transformation into substances which contribute to the aroma of the roasted product.

M. S. ANDERSON

**Determination of the content of cacao shells in cocoa powder.** J. A. EZZENDAM. *Pharm. Weekblad* 60, 603-14 (1923).—Analyses of 6 varieties of cacao shells gave av. values of fat 3.5, moisture 11.7, crude fiber 17.2, pentosan 8.2%. Cocoa powder normally contains a small amt. of shell, and the following may be considered a typical analysis: fat 25.6, moisture 5.8, crude fiber 6.5, pentosan 3.0%. Adulteration of cocoa powder with shell cannot therefore be detected by chem. analysis unless a considerable amt. of shell has been added. The quant. method proposed consists essentially in estg. the cross-section area of the shell fragments under the microscope. Grind the sample until it passes completely through a 1 mm. sieve. Weigh out a sample (3.0-0.5 g. according to the amt. of shell), boil 0.5 min. with 50 cc. of 10%  $HNO_3$ , wash with  $H_2O$ , boil 0.5 min. with 50 cc. of 2.5% NaOH and wash again, filtering each time on muslin of 48 threads per cm. Treat the residue with 10 cc. of 50% glycerol. Spread out the mixt. in a counting chamber on the microscope stage, and count the shell particles lying within 3 strips  $80 \times 1.5$  mm. each. Each particle is estd. as 1, 2, 3, etc.,  $\times$  an area of  $150\mu^2$ . The total (per 1 g. sample) divided by the factor 144 (no. of particles of  $150\mu^2$  counted thus in 1 g. of 1% cacao shells) gives the percentage of cacao shells in the sample. With a little practice the detn. can be performed in 0.75-1.0 hr.

A. W. DOX

**A new rapid method for the estimation of theobromine in cacao.** TRIFÓN UGARTE. *Anales asoc. quím. Argentina* 10, 399-402 (1922).—Same procedure as C. A. 16, 1470.

L. E. GILSON

**Analyses of Norwegian straw-fodders.** H. J. EIKELAND. *Meldinger fra Norges Landbrukshøiskole* 2, 235-77 (1922).—E. has gathered in tables a great many analyses of various Norwegian straw-fodders, made during several years at different Norw. official labs. The results are discussed and compared with corresponding analyses of Swedish and German straws. The same species show nearly the same chem. compn. in the 3 countries. Generally the fiber content increases and the protein and ash content decrease the later the fodder is harvested, whereas the N-free ext. has a slightly increasing tendency.

CHR. H. A. SYVERTSEN

**Experiments with fodder plants in South Africa, and their chemical composition.** A. SKIBBE AND P. F. SELLSCHOP. *J. Dept. Agr. Union S. Africa* 4, No. 4, 338-49 (1922); *Bull. Agr. Intelligence* 13, 827.—The various chem. changes which take place as a result of over drying have a natural tendency to make fodder plants less digestible, and the method of storing and mech. condition of the grasses affect to a certain extent the availability of the nutrients. This is demonstrated by the analytical data derived from analyses made in South Africa with Kikuyu grass (*Pennisetum clandestinum*) indicating a decided variation in compn.

H. C.

**Leaves, their composition, digestibility and value in the production of milk.** H. ISAACSEN, et al. *Medlinger Norges Landbrukshøiskole* 2, 161-88 (1922).—Dried leaves as compared with ordinary hay contain a larger proportion of protein and fat and a smaller quantity of crude fiber. There is a considerable difference among the various kinds of leaves; thus the figures for the contents of protein vary from 18.3% in alder to 9.2% in aspen, estd. from leaves contg. 85% dry matter. The contents of

raw fat vary from 12% in birch to 5.1% in alder. The raw fat in leaves chiefly consists of less important substances, such as wax and resins. The quantity of dry matter in the leaves is dependent upon the time of harvesting; leaves gathered in June contained 66% H<sub>2</sub>O, and those gathered in Sept. 53%. The percentage compn. of the dry substance does not appear to vary appreciably within reasonable times of harvesting. Expts. with sheep showed that the nutritive material in several kinds of leaves is more easily digested than that of hay, while in other kinds it was rather difficult of digestion. The coeff. of digestibility of the org. dry matter in dried rowan leaves was 66, in aspen 55, in alder 46 and in birch 44. The coeff. for protein varied from 57 in rowan to 32 in birch, for raw fat from 50 in birch to 15 in alder, for carbohydrates (N-free ext. + crude fiber) from 72 in rowan to 46 in birch leaves. The digestibility is smaller in leaves gathered later in summer than in leaves gathered earlier. The coeffs. for org. dry matter in alder leaves gathered June 10, Aug. 10, and Sept. 13, were, resp., 56, 47, and 46. Those kinds of leaves which contain an abundance of tannic acid, as alder and birch, have lower figures for digestibility than those which contain a low degree of tannic acid as rowan. From expts. with cows the leaves seemed to possess a milk-producing value rather larger than that of ordinary hay. The leaves had no regular, sp. effect upon the content of fat in the milk.

**Albumin replaced by urea in the food of milk-producing animals.** A. MORGEN, C. WINDHEUSER and E. OHLMER. *Landw. Versuchsst.* 99, 359-66(1922); *Bull. Agr. Intelligence* 13, 1364-6; cf. C. A. 16, 2167.—Albumin may be to some extent replaced by urea without reducing the milk yield, and the price alone will decide whether this substitution is advantageous or not. Large quantities of urea, however, should be avoided. **Numerous feed tests on cows with urea.** J. HANSEN. *Deut. landw. Tierzucht* 26, 313-5; *Bull. Agr. Intelligence* 13, 1364-6.—When feeds are rich in carbohydrates but poor in albumin, urea may be of practical value.

**The use of cod-liver oil in the feeding of farm animals.** J. C. DRUMMOND, S. S. ZILVA and J. GOLDING. *J. Agr. Sci.* 13, 153-61(1923).—The nutritive value, market qualities, and analyses of cod-liver oil are reported. The quality and amts. to be used are discussed and the manner of administering is given.

**Corn-oil cake meal for growing and fattening pigs.** JOHN M. EYVARD, RUSSELL DUNN, E. J. STRAUSBAUGH, D. B. ADAMS and H. B. WINCHESTER. *Proc. Iowa Acad. Sci.* 28, 135-46(1921).—Corn-oil cake meal contains approx. in every 100 lbs., 9 lbs. of water, 22 lbs. of crude protein, 47 lbs. of non-fat ext., 10 lbs. of crude fiber, 10 lbs. of ether ext. and 2 lbs. of ash. Corn-oil cake meal in itself is not a complete ration. Added to a corn and tankage ration it is quite efficient; it saves considerable corn and tankage when properly fed, and seems to supply certain deficiencies in said ration. Corn-oil cake meal mixed with skim or buttermilk is a splendid combination for balancing the farm grains. It took 90% as much protein for 100 lbs. gain where corn-oil cake meal was mixed with tankage and fed with corn as where tankage was fed straight with corn.

**The nature of the pigment of silage.** H. E. WOODMAN. *J. Agr. Sci.* 13, 240-2 (1923).—Through chem. test it has been shown that phaeophytin is the pigment in silage, and is stated to be produced from the action of carbonic and org. acids, developed during fermentation, upon chlorophyll.

**Sunflower silage.** A. AMOS and H. E. WOODMAN. *J. Agr. Sci.* 13, 164-8(1923).—A preliminary study, resulting in no definite conclusions as to recommending this crop as an ensilage for England. Further studies are desirable.

**The fodder value of potato plants.** F. HONCAMP. *Landw. Vers. Sta.* 100, 89-102 (1922).—The potato vines contained 1.4-1.95% of digestible protein and 13.8-15.35% starch equiv. based on dry wt.

**Loss of crude and digestible nutrients in the "burnt" hay preparations.** F. HONCAMP. *Landw. Vers. Sta.* 100, 79-87(1922).—"Burnt" hay preps. are obtained by superficially drying hay in the air and then stacking, whereby the hay heats and becomes dry. Brown hay is obtained by fermentation and heating. Ordinary hay is simply dried in the air. The results from feeding expts. are given.

**Figs as raw material for alcohol manufacture and as a stock feed.** J. BENAVENT. *Agriculture* 6, No. 3, 354-6(1922); *Bull. Agr. Intelligence* 13, 1153.—One of the products used in the manuf. of alc. is the fruit of the fig-tree, *Ficus carica*. The actual alcohol yield of ripe figs is almost equal to that of plums: 15 to 20 kg. of 90° alc. or 30 to 33 l. of 54° alc. is given by 100 kg. of dried figs. One hectare of fig trees produces 800 to 900 l. of 90° alc. The process of fermentation is described. **Nutritive value of figs before fermentation.**—According to the analyses made by Raventos (Barcelona), figs contain: protein 4.3, fat 0.3, sugars 71.2%; 3047 calories, whereas the analysis of wheat gives:

protein 10.7, fat 2.1, sugars 74.7% and 3519 calories. These figures explain the value of this food for the rapid and effective fattening of pigs. *Nutritive value of figs after fermentation*.—Analysis gives moisture, at a temp. of 160°, 85.71, ash 1.08, protein substances 1.75, fats 0.27, crude fiber 3.37, N-free exts. 7.82%. These results show that figs after fermentation make a good stock feed; they are very suitable for fattening cattle, though should not be fed to dairy cows. H. G.

**Presence of sulfur dioxide in cattle foodstuffs after fumigation.** H. ALAN PRACOCK. *Analyst* 48, 160-3(1923).—Various oil press cakes were exposed in block and powder form to fumes of burning S. The total amt. of reducing substances volatile in steam was detd. and showed that SO<sub>2</sub> may be absorbed by cattle cake and meal during fumigation but it disappears after about 1 week. The amt. absorbed depends on the variety of cake, the harder absorbing less than the softer, and on the condition, powd. absorbing more than block form. H. A. LEPPER

**Soy bean industries (WONG) 27.** Humanized and maternized milk (L. P.) 11E. Extraction of caffeine (WATSON, *et al.*) 17. Heat coagulation of milk (LEIGHTON, MUDGR) 11A. New sedimentation tube and its use in determining the cleanliness of drugs and spices (VIEHÖVER) 17.

**Edible fat preparation for persons having diabetes or acidosis.** M. KAHN. U. S. 1,455,254, May 15. Fats formed from fatty acids having an odd no. of C atoms in the mol. are used as foods without ill effects in cases of diabetes or acidosis when ordinary fats produce toxic effects. Undecylic, tridecyllic, pentadecylic, heptadecylic or nondecylic glycerides may be used.

**Margarine rich in vitamins.** T. B. LEXOW. Norw. 34,895, May 8, 1922. The margarine is manufd. by adding high-vitamin animal fats, *e. g.*, cod-liver oil, to common margarine. The product is specially suited for rachitis patients.

**Utilization of waste liquors from soy beans.** TORAZO NISHIMURA, TOJIRO KAWAKAMI and TYUJI MATSUMOTO. Japan. 41,259, Dec. 27, 1921. Waste liquors, obtained by immersing soy beans in H<sub>2</sub>O, are utilized for the manuf. of Japanese sauce.

**Apparatus for spray desiccation of milk.** A. J. WHITE. U. S. 1,457,803, June 5.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**The place of chemistry in business.** A. D. LITTLE. *Pulp Paper Mag. Can.* 21, 501-3(1923).—An address. A. PAPINEAU-COUTURE

**Chemistry and economics.** KRETZSCHMAR. *Chem.-Ztg.* 47, 389-91(1923).—A plea for establishing closer connections between chemistry, theory of management and economics, and proposed courses of study to accomplish these ends. A fundamental study of (a) machinery and app., (b) raw, intermediate and finished products, and (c) the history of industry, should replace conventional courses in economics. W. C. EBAUGH

**The principles of transference of heat.** G. J. GREENFIELD. *Chemistry & Industry* 42, 390-2, 417-9(1923).—A brief review and discussion of general principles. The small effect of the thermal resistance of metal as compared to fluid films is shown. Approx. values are given for film coeffs. in special cases, mainly quoted from McAdams and Frost (*C. A.* 15, 1354, 3351; 17, 318). W. L. BADGER

**An extension of the theory of gas-absorption towers.** W. B. VAN ARSDEL. *Chem. Met. Eng.* 28, 889-92(1923).—The paper is too mathematical to condense. "Abandoning the arbitrary assumptions involved in the use of the logarithmic mean formula, a general analysis of factors has been made and a fundamental relationship between the variables evolved. This relationship has been checked by a plant experiment." Cf. *C. A.* 10, 2785; 14, 2971; 15, 715, 2137; 16, 1354. E. R. G. ARDAGH

**Solvent recovery from the fire-hazard standpoint.** W. D. MILNE. *Chem. Age* (N. Y.) 31, 201-5(1923). E. H.

**Drill-oils.** ALF. BANG. *Jernindustri* 3, 108(1922).—The various types of aq. oil-emulsions used for lubricating purposes are briefly considered. In most cases a contamination by small amts. of NaCl (about 2%) will spoil the emulsions. CHR. H. A. SYVERTSEN

**The problem of insulation.** J. B. WHITEHEAD. *J. Am. Inst. Elec. Eng.* 42, 618-22(1923).—Report of the Committee on Elec. Insulation, Nat. Res. Council. C. G. F.



Comparative investigation of mineral and plant oils used for lubricating purposes. M. A. KAKUSIN. *Petroleum Z.* 19, 454-6(1923).—The following data for various lubricating oils are given:

	Viscosity at.					Other physical constants
	80°	100°	130°	160°	180°	
Cylinder oil 000 before purifying	16.82	8.73	2.65	1.76	1.67	$d_{15}$ 0.9211, flash 300°, resin content 52%, carbonization constant $K = 1/1\% = 0.9234$
After 3 treatments with $H_2SO_4$	13.17	7.25	2.88	2.00	1.73	$K = 1/1\%$ at 15°
After treating with 10% Floridin	14.46	5.92	2.55	1.76	1.69	$K = 1/1\%$ , $d_{15}$ 0.9143
After 3 treatments with Floridin and acid	8.46	4.92	2.44	1.65	1.36	$K = 1/1\%$ , $d$ 0.9143 $d_{15}$ 0.9611, flash 260°
Rapeseed oil	3.69	2.59	1.73	1.38	1.28	$I$ no. 82
Machine oil	2.63	1.53	1.34	1.23	1.00	Flash 190°
Blown castor oil	12.43	4.51	2.78	2.0	1.53	Flash 150°, $I$ no. 63.41
Ordinary castor oil	2.00	1.63	1.32	1.15	1.03	Flash 220°, $I$ no. 100.96

D. F. BROWN

Development of the uses of liquid chlorine in Germany. HENRI MURAUOR. *Chimie et industrie* 9, 806-8(1923).

A. PAPINEAU-COUTURE

Benzene poisoning. J. F. HOGAN AND J. H. SHRADER. *Am. J. Pub. Health* 13, 279-82(1923).

NATHAN VAN PATTEN

Concrete in the construction of chemical manufacturing facilities (IRWIN, ASHTON) 20.

BYRDEN, CHARLES L. AND DICKEY, GEORGE D.: *A TextBook of Filtration*. Easton, Pa.: Chemical Publishing Co. 376 pp. \$5.50. Reviewed in *Sugar* 25, 265(1923).

Concentrating liquids by hot gases. I. HECHENBLEIKNER and T. C. OLIVER. U. S. 1,456,874, May 29. Heated air or other hot gases are injected into a body of sludge acid from *petroleum refining* or other liquid to be concd., below the level of the liquid, and are caused to move over the liquid for a substantial horizontal distance to effect heat exchange.

Clarifying oils and solvents. N. E. WILLIS. Brit. 189,701, Feb. 13, 1922. Oils and solvents are clarified for further use by agitating them, preferably by compressed air, with a mixt. of  $H_2O$ , glycerol and a chloride or  $HCl$ , the last two ingredients being substantially in equal proportions. For clarifying benzine and like solvents, a mixt. consisting of glycerol 5,  $CaCl_2$  or  $HCl$  5, and  $H_2O$  90% is used. For oils, such as used lubricating oil, glycerol 10, a chloride 10, and  $H_2O$  80% is suitable. After agitation the oil or solvent is allowed to settle and is decanted off, the dirt, grease, etc., remaining with the clarifying agent, which may be re-used until it becomes too thick, when it may be regenerated by filtration through a sand or other filter.

Finely divided solid substances. F. GOLDSCHMIDT AKT.-GES. and V. KOHL-SCHÜTTER. Brit. 189,706, Feb. 27, 1922. Substances are obtained in a high degree of dispersion by heating in a current of air,  $CO_2$ , etc., to such a high temp. as to produce vapors substantially free from fumes, and condensing the vapors to fumes, which are then pptd. electrically. The products are suitable for use as catalysts for gas reactions, as absorbents for clarifying liquids, as precipitants for dissolved substances, as mineral pigments, as opalizing agents, and as medicines. A chem. change may be effected during the process. Mixts. may be volatilized and condensed together. Metallic Sn may be melted in an elec. arc furnace and blown with air. The products are subjected to a whirling action in a large chamber and then passed to the elec. precipitator.  $SnO$  thus obtained gives a milky colloidal soln. with 0.02-0.01  $N NH_3$  or  $HCl$  soln., and is capable of pptg.  $H_3PO_4$  from  $HNO_3$  soln. It is adapted for use as an opalizing agent for glass or enamel.  $BiO$  similarly obtained from metallic Bi is applicable to china-painting. Catalytic substances such as Ni and Fe oxides, in conjunction with carriers such as oxides of Al, Ti, Sn, Si, or V, may be obtained by blowing electrically fused ferro-Ti, ferro-V, etc., and treating as above described. Colloidal subdivision of the oxides produced occurs on mere treatment with  $H_2O$ . After reduction by H,

the Fe products are pyrophoric if they contain more than 30% of the metal. Ni catalysts need not contain more than 20% of metal.

Controlling processes by light-sensitive cells. L. LOGAN. U. S. 1,455,795, May 22. Light-sensitive cells are employed to control liquid level in a tank or for control of various mech. operations.

Drying substances containing water of crystallization. AKTIESELSKAPET HOY-ANOFALDEN, NORSK ALUMINIUM CO. Norw. 35,636, Sept. 11, 1922. The substances are submitted to a sudden heating by being fed directly into an intensely heated part of a furnace, whereby the crystals will burst and give off more or less of their water of crystn.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW AND G. C. BAKER

Barium in the Harrogate waters. A. WOODMANSY. *Lancet* 1923, I, 22; *Pharm. J.* 110, 30(1923).—Ba rarely occurs in European mineral waters, no doubt because of sulfates present. In very low concns., Ba exerts a marked stimulating action on all forms of muscular tissue, and causes a gradual but sustained rise in blood pressure; this enables a purgative  $H_2O$  to be taken continuously without enervation resulting. The 3 principal Harrogate springs, "Old S,"  $FeCl_3$  and  $MgO$ , contain, resp., 6.91, 3.51 and 3.97 parts of Ba per 100,000. In addn., "old S" and  $FeCl_3$  contain, resp., 1:140,000, and 1:190,000 parts of dissolved  $BaSO_4$ . S. WALDBOTT

The sulfur content of rain water. L. N. ERDMAN. *Soil Science* 14, 363-7(1922).—The S content of rain water under rural conditions in Iowa was found to be about 3.32 p. p. m. The amts. of S obtained per month were fairly constant throughout the yr. and averaged about 1.24 lbs. per acre per month or about 15 lbs. per yr. This amt. is not sufficient to replace the loss by leaching and cropping. R. BRADFELD

Use of acids with alum in water purification and the importance of hydrogen-ion concentration. J. R. BAYLES. *J. Am. Water Works Assoc.* 10, 365-92(1923).—Further investigation indicated that best coagulation and least Al remained in the treated water when the  $p_H$  values of the water were between 5.5 and 7.0. Above and below these figures the amt. of coagulant required for clarification increases rapidly. The influence of org. colloids is a worthy subject for investigation, as very little is known at the present time; investigations seem to indicate that as the  $p_H$  value moves toward the acid side, (i. e., approx. 6.0) coagulation improves. Methyl red is recommended as the most satisfactory indicator. The relationship of  $p_H$  and corrosion is commented on and a very clear and interesting illustration given. Where both lime and iron are used they should be applied at the outset, but when alum is used the alkali should follow filtration. D. K. FRENCH

Effects of water treatment on the reduction of maintenance expense and increasing capacity of locomotives. W. C. SMITH. *J. Western Soc. Engineers* 28, 220-3(1923).—The Mo. Pacific R. R. is operating 81 softening plants, 36 of which are of the intermittent type and 45 of the continuous type. Six additional plants are under construction. Large savings are realized. G. C. BAKER

The effect of *Gambusia affinis* on the *B. coli* index of pollution of water. L. C. HAVENS and SOPHIE A. DEHLER. *Am. J. Hyg.* 3, 296-9(1923).—The normal intestinal flora of *Gambusia* (top minnows) in Ala. waters is represented by *B. pyocyaneus* and an unidentified, aerobic, lactose-fermenting, spore-forming bacillus. *B. coli* was not found in the intestinal tract. When *Gambusia* were added to waters polluted with *B. coli* they caused the disappearance of this organism due largely to the inhibitory influence of *B. pyocyaneus*. Since these minnows destroy *B. coli* they may render the colon index an unreliable guide to pollution. G. C. BAKER

The action of certain bacteria on the nitrogenous material of sewage. E. G. BIRGE. *Univ. Wis. Studies in Science*, Madison, No. 2, 139-50(1921); *Abstracts Bact.* 6, 128.—*B. coli*, *B. cloacae*, *B. pyocyaneus*, *B. vulgaris*, *B. mesentericus* var. *ruber*, and *B. subtilis* were studied to det. their effect on fresh sewage. They were grown under aerobic and anaerobic conditions in pure and in mixed cultures. Particular attention was paid to the changes in free  $NH_3$ , org. N, nitrites and nitrates. The most striking results were obtained with *B. subtilis* which showed marked ammonifying power under aerobic conditions and it is suggested that this organism may be made to play an important part in the treatment of sewage. H. G.

Sewage disposal and the Chicago problem. H. P. EDDY. *J. Western Soc. Engineers* 28, 165-78(1923).—The history is traced of the disposal of Chicago sewage,

beginning with direct discharge into Lake Michigan and followed by the development of the Sanitary District. In considering purification measures necessary at the present time modern methods of sewage disposal are reviewed. These include screening, coarse and fine racks, grit chambers, sedimentation and digestion tanks, contact beds, trickling filters, sand filters and the activated sludge process. The Milwaukee development and dewatering expts. are briefly described. The Board decided in favor of the activated sludge process in preference to Imhoff tanks and trickling filters for the treatment of the sewage of the North Side of the Sanitary District. Sludge will be disposed of by lagooning.

G. C. BAKER

**The sanitary district of Chicago.** LANGDON PEARSE. *J. Western Soc. Engineers* 78, 179-94(1923); cf. *C. A.* 17, 2024.—The problems and future work planned for the Sanitary District are outlined. Treatment of wastes is necessary because in the present canal dñn. is inadequate. The development provides for 5 main projects. The North Side project will serve a population of 800,000 in 1930, the West Side 1,250,000, the South Side 1,230,000, the Calumet region 225,000, and the present Des Plaines River plant serves 40,000. A small plant is in operation at Morton Grove and a similar plant is planned for Glenview. In addn. wastes equiv. to about 1,500,000 population, from 3 industrial centers, Packingtown, Corn Products Refining Co., and Tanneries along the North Shore must be handled. The sanitary condition of the main channel and the Illinois River and analytical results obtained in coöperation with the Public Health Service are discussed. Charts show that exhaustion of O is much more complete and the O demand greater during warm weather. Bacterial content decreases as the sewage flows down the river. The present plants and works are described. Activated sludge is valuable as a fertilizer and may pay for its prepn. on a large scale, but because of unsatisfactory methods of handling it is to be pumped away and marketing postponed. Dewatering devices are described.

G. C. BAKER

**Apparatus for purifying water.** W. M. CROSS. U. S. 1,457,503, June . Glaucosite, Ca hypochlorite and NaCl are held in 3 sep. receptacles for purifying H<sub>2</sub>O and regenerating the glaucosite.

**Softening water with exchange silicates.** T. R. DUGGAN. U. S. reissue 15,618, June 5. See original pat. 1,276,629; *C. A.* 12, 2102.

**Preventing water from absorbing air.** D. B. MORISON. U. S. 1,455,927, May 22. Degassed boiler feed water or other liquid is fed into and removed from a closed container below the liquid level in the container so that the surface of the liquid is maintained quiescent and a current of the vaporized liquid is caused to flow continuously across the entire surface of the liquid within the container.

**Apparatus for heating and degasifying water.** W. S. ELLIOTT. U. S. 1,457,153, May 29.

**Digesting waste-water sludge.** K. IMHOFF. U. S. 1,456,557, May 29. In decomposing waste-water sludge in digestion chambers, part of the sludge is kept for some time in a sep. "hatching chamber" at an elevated temp. suitable for the methane putrefaction and then mixed with the remainder of the sludge, to insure its proper decompn.

**Treating sewage.** J. P. BALL. U. S. 1,456,046, May 22. Sewage sludge is atomized, discharged into a closed chamber and subjected to the action of light, heat and aeration. After this treatment, sepd. portions are drawn off independently.

**Apparatus for sedimentation, aeration and drying of sewage sludge.** K. IMHOFF. U. S. 1,456,312, May 22.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Some factors affecting the evaporation of water from soil.** E. A. FISHER. *J. Agr. Sci.* 13, 122-43(1923).—The subject is developed from a physico-chem. and mathematical standpoint, with detailed exptl. data.

R. B. DEEMER

**The laterite soil of Goa.** P. C. APONSO. *Tropical Agr.* 59, 276-80(1922).—Partial chem. analyses are given of 5 laterite soils in Goa and of 3 such soils from Brit. India.

M. S. ANDERSON

**The relation of soil moisture and nitrates to the effects of sod on apple trees.** T. L. LYON, A. J. HEINICKE AND B. D. WILSON. *Cornell Agr. Expt. Sta., Mem.* 63, 25 pp.(1923).

J. J. S.

**Determination of the organic matter in the soil.** K. A. BOUDORFF AND R. H. CHRISTENSEN. *Tids. Planteavl* 28, No. 2, 265-75(1922); *Bull. Agr. Intelligence* 13,

1307.—Place a soil ext. contg. 0.25 g. of soil in a glass with 50 cm. of diluted  $H_2SO_4$  (8:200). Heat for 20 min. in a dish, add 50 cm. of a 0.05 N soln. of oxalic acid and titrate with 0.02 N soln. of  $KMnO_4$ . H. G.

**Fertilizer experiments (on cane in Mauritius).** P. DE SORNAY. *Rev. agr. Maurice* 1, No. 7, 8-13(1923).—Excellent results (given in detail) have been obtained in five different places with 100-150 kg.  $NaNO_3$  per acre.  $(NH_4)_2SO_4$  did not do so well. No decided effect on the sugar content of the cane was noted. No definite conclusions can as yet be drawn from tests with mixed fertilizers, but it is certain that they should contain more N than either P or K. F. W. ZERBAN

**Researches made in Denmark upon the effect of soil conditions on bacterial life and the chemical transportations taking place in the soil: the capacity for decomposing mannitol.** H. R. CHRISTENSEN. *Tidss. Planteavl* 28, Pt. 1, 1-58(1922); *Bull. Agr. Intelligence* 13, 306-7.—The moisture content of a soil detrs. the rapidity as well as the course of the mannitol decompn. process, and in order to attain the approx. max. decompn., the humidity must be about 75% of the water capacity of the soil. The rate of the mannitol decompn. varied within very wide limits. There is a definite relation between the reaction of the soil (especially within limits very close to the point where it becomes neutral) and its power of decomposing mannitol, for soils that are shown to be well supplied with lime, and are thus favorable to the development of *Azotobacter*, generally have a greater capacity for decomposing mannitol than those having a deficiency of lime and lacking *Azotobacter*. This difference is still more noticeable, if distinctly acid or alk. soils are compared. There are, however, notable exceptions to this rule. The rapidity of the mannitol decompn. depends on the presence of slightly basic lime compds. and readily sol.  $P_2O_5$ . Alkaline reaction and the presence in the soil of certain basic compds., like those of lime, are necessary conditions of a somewhat high content of  $P_2O_5$  sol. in water contg.  $CO_2$ , and the form under which  $P_2O_5$  is found in soils is detd. to a large extent by their reaction. H. G.

**The use of the ash of *Atriplex halimus* as a fertilizer.** J. COULOUMA. *Bull. pharm. Sud-Est; Bull. agr. Algérie, Maroc* [2] 27, No. 4, 66-7(1921); *Bull. Agr. Intelligence* 12, 820-1.—*Atriplex halimus*, formerly restricted to the coastal belt in Languedoc, has gradually spread all over the large stretch of tertiary soil round Béziers. It is common also on the secondary soil of Montpellier. The ash of this plant, contrary to the general rule, is not carbonated or alk. but chloride. KCl represents  $\frac{1}{3}$  of the green plant. Analyses are given. The ashes are slightly greenish in color, owing to a metal which it has not been possible to det. C. recommends the introduction of this plant, which spreads very rapidly, into waste land, and the utilization of its ash as a potassic fertilizer. H. G.

**Ash from cutch manufacture as a fertilizer.** V. R. GREENSTREET. *Malayan Agr. J.* 10, 262-3(1922).—The ash from the manuf. of cutch is a white, hygroscopic, alk. powder, analyzing in %:  $K_2O$  8.2,  $P_2O_5$  0,  $CO_2$  10.4,  $CaO$  43.2,  $SiO_2$  1.7,  $Fe_2O_3$  +  $Al_2O_3$  6.4,  $MgO$  0.6,  $SO_3$  1.7,  $H_2O$  14.4, combined  $H_2O$  + org. material 15.7. Its value as a fertilizer is approx. 0.5 that of  $CaO$  +  $\frac{1}{6}$  that of com.  $K_2SO_4$ . C. C. DAVIS

**Composition of filter press (lime) cake.** S. F. SHERRWOOD. U. S. Dept. Agr., *Circ.* 237, 1-3(1923).—Analyses of representative samples of filter press cake produced in beet sugar manuf. show that the material consists largely of  $CaCO_3$  and should therefore be suited for *liming soils*. It also contains comparatively small quantities of N,  $P_2O_5$ ,  $K_2O$  and org. material but not necessarily in a form immediately available for plant food. W. H. ROSS

**Theoretical and practical basis of fertilization by carbon dioxide.** H. LUNDEGARDH. *Angew. Botanik* 4, 120-51(1922).—The  $CO_2$  assimilation by the leaves of carrots and beans grown in closed cylinders was found to vary proportionally to the  $CO_2$  content of the air in the cylinders. Estn. of the  $CO_2$  in the atm. immediately around the leaves of plants growing in manured fields showed that ordinary dressings of manure may cause as much as 28% variation. Artificial fertilizers also affected the  $CO_2$  concn. around the plants. Bornemann's method of spreading manure as late as possible and working it in just below the surface had no particular advantage. The  $CO_2$  production was practically the same as when the manure was deeply buried. The concn. of  $CO_2$  at the level of the assimilating leaves is considered by L. to be controlled by the amt. produced by the soil. The wind velocity had but little influence on the  $CO_2$  in the air layer next to the soil. Rain and warmth strongly affected the  $CO_2$  production of the soil. J. S. C. I.

**Results of two years experiments with superphosphate, "tetraphosphate" and phosphorite in Italy.** F. AVANZI. *L'Agricoltura italiana* 44, Pts. 1-5, 145-55(1921); *Bull. Agr. Intelligence* 13, 469-70.—The expts. were carried out in two adjoining fields

divided into 8 plots. Maize was grown in the fields in 1918, and winter wheat in 1918-1919; the maize succeeded a temporary winter pasture fertilized with farmyard manure; the wheat had been fertilized with Na nitrate. The total  $P_2O_5$  content of the superphosphate used was 15.10%, of which 14.65% was sol. in water and  $NH_4$  citrate. The tetraphosphate was found by analysis to contain 26.22%  $P_2O_5$  of which 1.68% was sol. in 1% citric acid, while the phosphorite contained 26.70%  $P_2O_5$  of which 2.12% was sol. in 1% citric acid; both the latter compds. were equally finely ground. The phosphorite had no appreciable effect upon either the first or the second crop. The tetraphosphate exerted a beneficial effect upon both the first and the second crop. The action of the tetraphosphate upon both crops was less than that of the mineral superphosphate, although the latter had a considerably lower  $P_2O_5$  content. As the difference in the price of the  $P_2O_5$  unit was not proportional to the difference in the efficacy of the two fertilizers, the inferiority of the tetraphosphate is abs. H. G.

**Solution of the phosphoric acid problem in countries with debased currency.** P. KRISCH. *Z. angew. Chem.* 36, 130-4 (1923).—Recent work of Lemmermann (C. A. 17, 1296) on silicic acid as a partial substitute for  $P_2O_5$  is reviewed. New forms of  $P_2O_5$  fertilizers, such as sinter phosphate, Plauson's colloidal phosphate, etc., utilizing raw material unsuited for superphosphate manuf., are discussed, together with results of recent expts. indicating their value to be comparable with that of basic slag and superphosphate. P. R. DAWSON

**Researches on availability of the phosphoric acid of basic slag and other phosphates by means of sand cultures.** J. G. MASCHHAUPT. *Versl. Landbouwk. Onderz. Rijkslandbouwinstitut.* 1922.—The availability of phosphates is to be measured by their actual soly. in the soil soln. rather than by the rate of soly. The Wagner test is suitable only for basic slags. Estn. of availability by means of a soln. of  $CO_2$  is useful but gives rather too favorable figures for low-grade phosphates. The above methods were compared by means of oats fertilized with  $NaNO_3$ . Other crops with other fertilizers probably give different relative values. Potash in plants can be partially replaced by soda and lime, since the sum of the equivs. during two years' cropping was practically the same. J. S. C. I.

**Quantity of assimilable phosphoric acid and potassium in soils.** CH. BRIOUX. *Ann. de sci. agron.* 39, 82-100 (1922); *Bull. Agr. Intelligence* 13, 1088-91.—Soil analysis limited to the study of its 4 principal elements (N, P, K and Ca) is insufficient for fixing the phosphoric acid and especially the potash needs of the soil. H. G.

**Organic phosphorus in soils.** OSWALD SCHREINER. *J. Am. Soc. Agron.* 15, 117-124 (1923).—The paper emphasizes 1st the proof of the existence of org. P in soils by the isolation of a definite org. compd. contg. it, namely nucleic acid, and 2nd the remarkable growth-promoting property of this org. P compd. Lecithins, phytins, nucleic acids, nucleoproteins and other complex compds. contg. P in an org. form are discussed in their relation to P in soils. The decompn. of nucleoproteins and nucleic acids in soils is schematically presented. The decided growth-promoting property of nucleic acid is not equalled by the usual inorg. nitrates or phosphates. F. M. SCHERTZ

**Experiments with "Rhenania" phosphate.** F. HASSELHOFF AND O. LIEBER. *Landw. Vers. Sta.* 100, 21-30 (1922).—Rhenania phosphate is obtained by melting together Ca phosphate, limestone, and silicate rock according to Messerschmidt's method. Pot and field expts., using neutral and alk. soils, show that there was no great difference in the behavior of Rhenania phosphate and Thomas meal. No correlation was shown between soil acidity and the effect of Thomas meal or Rhenania phosphate. F. M. SCHERTZ

**Experiments with Schröder's phosphate-potash.** EMIL HASSELHOFF. *Landw. Vers. Sta.* 100, 31-6 (1922).—Schröder's phosphate-potash is obtained by heating  $KCl$ ,  $MgCl_2$  and the chlorides of the alk. earths, with crude phosphate; the crude phosphate is decompd. by the  $HCl$  which arises. Expts. have shown that the resulting material is a useful fertilizer. F. M. SCHERTZ

**From what source are the plants getting their potash?** V. M. GOLDSCHMIDT. *Bergverksnyt* 15, 12-13 (1922).—Formerly it has been presumed that the absorbable potash in the soil is generated from the feldspars. G. shows that the K micas give off their  $K_2O$  much more readily than do the feldspars, when acted upon by chem. means, and that their  $K_2O$  contents are more rapidly absorbed by the plants. The mica potash is approx. 10-50 times more sol. in common soils than that of the feldspars. Finely ground high-biotite rocks may be used as slowly acting fertilizers. Extn. of the potash by chem. means is technically possible. CHR. H. A. SYVERTSEN

**The valuation of insoluble phosphates by means of a modified citric acid test.**

G. S. ROBERTSON AND F. DICKINSON. *J. Soc. Chem. Ind.* **42**, 59-66T (1923).—Modification of the official (Wagner) citric acid method so as to use a sample of 1 g. in place of 5 g. gives a different set of values for the newer basic slags and rock phosphates, generally indicating a higher soly. The results of field expts. recently completed (*C. A.* **16**, 2006, 3725) show that the citric soly. more closely approximates the field results when the 1 g. sample is used in place of the official 5 g. Accordingly a plea is made for such a modification of the present official method in order to arrive at more accurate evaluation of the newer phosphates. A discussion is appended.

**The prices of nitrogen.** MARCEL POMIER-LAYRARGUES. *Prog. agr. vit.* **79**, 419-27 (1923).—An economic discussion. P. R. DAWSON  
P. R. D.

**The influence of copper sprays on the yield and composition of Irish potato tubers.** F. C. COOK. U. S. Dept. Agr., *Bull.* **1146**, 1-26 (1923).—Analyses of potato tubers from Cu-sprayed plants made at various periods of their growth showed that the proportion of solids, starch and N was usually higher than in tubers from unsprayed vines. The starch content increased approx. 50% as the tubers matured, while the dextrose disappeared and the sucrose was materially reduced. The total ash content remained const. during the same period, but the sol., coagulable and particularly the mono-amino and amide N increased. A larger yield of potatoes was secured from Cu-sprayed than from non-Cu-sprayed vines, and av. data for 7 States obtained in 1919 showed the food value of an acre of Cu-sprayed potatoes was 839 lbs. more than for an acre of non-Cu-sprayed potatoes. A comparison of results obtained with 10-10-50 and 5-5-50 Bordeaux mixts. indicated that the former has no advantage over the latter and that it may possibly furnish too much Cu for the max. stimulating or protective effects. Pickering-lime-water spray and a Ba-water spray gave practically the same increase in yield and in solids of the tubers as a Bordeaux spray. W. H. ROSS

A quantitative study of the insecticidal properties of *Derris elliptica* (FRYER, *et al.*) 11D. S content of rain water (ERDMAN) 14. Phosphates (Japan. pat. 41,223) 18. Soluble phosphates (Japan. pat. 41,224) 18.

**Fertilizer.** W. HAZEN and W. H. ROSS. U. S. 1,456,850, May 29. KCl is treated with an excess of concd.  $H_3PO_4$  and (after driving off HCl by heating) the product is dild. with  $H_2O$  and the excess acid neutralized with  $NH_3$ . The combined salts which are pptd. are sepd. for use as a fertilizer.

**Potassium phosphate fertilizer.** W. H. ROSS and W. HAZEN. U. S. 1,456,831, May 29. KCl is treated with an excess of concd.  $H_3PO_4$  and HCl is driven off by heating. The remaining soln. is dild. with  $H_2O$ , cooled and cryst. salts are sepd. which are adapted for use as a fertilizing material.

**Fertilizer from peat.** F. J. NASH. U. S. 1,456,332, May 22. A stack of peat is dried by heat applied to the interior of the stack while allowing air to circulate through the body of the stack during a portion of the drying. After the air circulation is shut off the heating is continued to complete the drying and obtain a product which is suitable for use as a fertilizer.

**Fertilizers.** J. GRADL. Brit. 189,419, Aug. 24, 1922. Addn. to 23,067. Coal or lignite, used for making fertilizer by admixt. with catalysts or oxidizing agents, as described in the principal patent and in 185,729 (*C. A.* **17**, 177), is prepd. by heating to temps. below the sintering point, or by treatment with solvents, acids, such as  $H_2SO_4$  or  $HOAc$ , alkalis or superheated vapors, or by such treatment as will render the coal or lignite capable of being thoroughly wetted. Acids or substances having an acid reaction may be used as additional ingredients in fertilizers made as described in the above-mentioned specification. Cu salts, with or without  $NH_3$  salts, or other substances that contain or give off  $NH_3$ , may be used as catalysts. Examples are given.

**Storage of calcium cyanamide.** KENJI FUJITA. Japan. 41,323, Dec. 27, 1921. When  $CaCN_2$  is stored in air, many compds., such as  $Ca(CN.NH)_2$ ,  $(CN.NH)_2$ ,  $CO(NH_2)_2$ ,  $C_2N_2(NH_2)_2$ ,  $NH_3$ , etc., are produced by the action of  $H_2O$  and  $CO_2$  in air and some N in the material is lost. To prevent the change and loss of N, granules or masses of  $CaCN_2$  are covered with a thin film of  $CaH(PO_4)$ ,  $Ca(OH)_2$ , alkali carbonates, etc., by treating them with about 10%  $H_3PO_4$ ,  $K_2HPO_4$ ,  $CaH_2(PO_4)_2$ , etc.

**Insecticidal arsenical solutions.** A. MAI. U. S. 1,456,509, May 29. A fusion product formed by heating together  $As_2S_3$  and  $AsBr_3$  or phthalyl chloride or other halogen compd. is dissolved in  $EtOAc$ , acetone, alc. or other org. solvent, to prep. a soln. which may be used for impregnating wood or mixed with  $Ca(OH)_2$  and  $H_2O$  for spraying plants.

Disinfectant, insecticide and fungicide. H. CARSTENS and C. HANSEN. U. S. 1,457,652, June 5. A mixt. contg. S, Na monosulfide and Ba monosulfide.

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

The ethyl alcohol industry in 1921. KARL SCHWEIZER. *Schweiz. Chem. Ztg.* 1922, 551-8, 567-71, 599-604. E. H.

Evolution in the equipment of breweries. A. FERNBACH. *Chimie et industrie* 9, 651-3(1923).—Brief review of improvements in the brewing industry during the last 30 years. A. PAPINEAU-COUTURE

The denaturing of alcohol. CHARLES BARON. *Rev. chim. ind.* 31, 328-30(1922).—A discussion of the unsuitability of wood alc. as a denaturant for fuel alc. for internal-combustion motors and of the properties required of a suitable denaturant. A product obtained by catalytic distn. of rosin and of pitch from pine waste is suggested as being suitable. A. PAPINEAU-COUTURE

The decacidification of musts and wines. L. FERRÉ and CH. MARCHAIS. *Rev. vit.* 58, 345-52(1923).—A discussion of chem. and biological methods for reducing excessive acidity in musts and wines. P. R. DAWSON

The use of wine residues after distillation. F. FEVRIER. *J. Dept. Agr. Union S. Africa* 6, 381-7(1923).—Very complete directions are given for the prepn. of Ca tartrate from wine residues. K. D. JACOB

The diastases of malt. M. H. VAN LAERE. *Bull. inst. sup. ferm. (Gand)* 1922, 1-112; *Physiol. Abstracts* 7, 570.—A study of the chem. compn. of the barley grain and its modifications in malting. H. G.

Acetone, butanol, and ethanol in gas from the butyric fermentation of corn. A. L. DAVIS. *Ind. Eng. Chem.* 15, 631-2(1923).—During fermentation of corn mash by *B. granulobacter pectinovolum* for the production of butanol gases are formed consisting chiefly of CO<sub>2</sub> and H<sub>2</sub> in addition to quantities of acetone, EtOH, BuOH and H<sub>2</sub>O vapor. 1000 cu. ft. of gas from a gassing fermenter was passed into activated carbon and the absorbed gas removed by distg. with cresol. 0.116 to 0.124 gals. of solvent, consisting of 70% acetone, 20% BuOH and 10% EtOH, were recovered per 1000 cu. ft. of gas. Cresol contg. 95 to 97% tar acids was passed through the tower at the rate of 250 cc. per hr. with a gas flow of 50 cu. ft. per hr. The cresol was sepd. from the condensed H<sub>2</sub>O and fractionated. From 1000 cu. ft. of gas 0.111 gal. or 89.4% of the solvents present was absorbed. The max. concn. of solvent which cresol absorbs in contact with gas contg. 2 to 3 times the amt. necessary to sat. it is 12.8% by vol. C. N. FREY

Oenological products and yeast foods. FILAUDEAU and A. BONIS. *Ann. fals.* 16, 148-53(1923).—Results of an investigation of these products as found on the French market in 1922. A. PAPINEAU-COUTURE

Figs as raw material for alcohol manufacture and as a stock feed (BENAVENT) 12.

Distilling alcohol. SOCIÉTÉ E. BARBET ET FILS ET CIE. Brit. 189,458, Nov. 21, 1922. In a continuous app. for distg. and rectifying alc. of the kind described in 107,975 (C. A. 11, 2943) in which the vapors from a distg. column are used to heat the rectifying column and the purifying column, the distg. column is operated under a slightly increased pressure, the rectifying column under a reduced pressure, and the purifying column at atm. pressure. A suitable construction is specified.

Alcohol; fuel. P. LORLETTE. Brit. 189,453, Nov. 21, 1922. Addn. to 188,336. Abs. alc. is obtained by passing the vapors from, say, a dephlegmator through a succession of dehydrating agents of increasing effectiveness, *e. g.*, through lime and then metallic Ca or CaC<sub>2</sub>. Preferably each dehydrating agent is divided into two parts, the first of which is replaced when entirely used by the partly used second portion, which is replaced by unused agents; and the vapors are heated prior to or during contact with the dehydrating agent to prevent conduction thereon. The alc., with its absorbed C<sub>2</sub>H<sub>2</sub> if carbide has been used, forms permanent homogeneous mixts., suitable as motor spirit, with gasoline, benzene, or other usual liquid hydrocarbon fuels as described in the principal patent. The alc. may be used for any chem. or pharmaceutical prepn. or for a beverage. Any alc. or similar volatile liquid may be dehydrated similarly.

Dealcoholizing beer. G. ENGEL, SR. U. S. 1,453,313, May 1. A refrigerated drum is used for freezing out a film of non-alc. beer constituents. Liquid alc. film is

scraped off and removed from the frozen aq. film on the drum and the aq. film is then melted to obtain dealcoholized beer.

**Hydrolyzed collagen for nitrogen nutrition of yeast.** B. A. STAGNER. U. S. 1,457,319, June 5. Lime and  $H_2O$  are employed for hydrolyzing material contg. animal proteins such as collagen to obtain a nitrogenous material adapted for use together with cereal worts or other carbohydrate-contg. materials in the production of bakers' yeast. Hides, bones, cartilage, tendons or fish scales are referred to as collagen-contg. materials and if hides are used the hide material may be hydrolyzed by heating it to  $160-180^\circ$  for 3–10 hrs. with 10% its wt. of lime and 4 times its wt. of  $H_2O$ . The hydrolysis should be carried to an intermediate stage such that the product shall contain some of the N as amino acids and some in less complex proteoses. 29 parts of the hydrolyzed product may be mixed with a mash of 800 parts of grains such as mixed corn, barley and rye to prep. a yeast-nutrient soln. U. S. 1,457,320 relates to a similar process except that *ligamentum nuchae* or other material contg. elastin is specified as starting material for prep. the nitrogenous yeast-nutrient material by hydrolysis with lime and  $H_2O$  under identical conditions. In either instance, the nitrogenous soln. produced by the hydrolysis may be filtered and neutralized with  $H_2SO_4$  and refiltered to remove  $CaSO_4$  and may be concd. or even evapd. to dryness for future use.

**Apparatus for aeration and sedimentation of sewage.** J. A. COOMBS. U. S. 1,456,914, May 29.

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**The composition and the toxicity of the arsenobenzenes.** A new process of determining arsenic in these products. DE MYTENAERE. *Bull. acad. roy. med. Belg.* [5] 3, 258–80 (1923).—In order to det. the total As dissolve 0.2 g. of the prepn. in 5 cc. water and add 10 cc.  $H_2O_2$  and 50 cc. 50%  $H_2SO_4$ ; heat, add more  $H_2O_2$  and then  $KMnO_4$  as long as this is decolorized. Reduce the  $As_2O_3$  by KI, remove free I by  $Na_2S_2O_3$  and titrate the  $As_2O_3$  by iodine. The C, S and H contents of arsenobenzene preps. have no influence on their toxicity; only As and N detns. permit conclusions on this point. The ratio As:N should not differ considerably from the theoretical value. Another detn., important for the toxicity of the arsenobenzene, is the amt. of As which can be pptd. by  $H_2S$ , termed the *DM-index*. Dissolve 1 g. of the prepn. in 90 cc. boiling water and add 10 cc. 30%  $AcOH$ . Heat on a water bath for 10 min., filter and det. As in the filtrate iodometrically as described above. The product which remains on the filter in this operation is a mixt. of dihydroxydiaminoarsenobenzene monomethylsulfoxylate and unsubstituted dihydroxydiaminoarsenobenzene; on cooling the filtrate another product seps. which contains the same compd. and also dihydroxydiaminoarsenobenzene dimethylsulfoxylate. All products are toxic in which the factor *DM* is larger than 12. The *DM-index* increases by oxidation in the air. For this reason samples from the same product may have a different *DM* according to the air contained in the ampules; *DM* should be called, therefore, *index of oxidation*. The compd. which causes the splitting off of As, detd. by the *DM-index*, must be a substituted arsenic oxide. A mixt. of substituted arsenic oxides was prepd. by the action of rongalite upon hydroxyaminophenylarsenoxide; this mixt. gave reactions with  $AcOH$ , similar to those of impure arsenobenzenes. Since hydroxyaminophenylarsenic oxide hydrochloride is not pptd. by  $H_2S$  M. concludes that the substance detd. by the *DM-index* is arsenic oxide methylene sulfoxylate. M. concludes with polemical remarks against Raiss and Falkov (*C. A.* 15, 2960) and Carrière (*Office international d'hygiène publique* 1922, 25).

R. BRUTNER

**Is the determination of the viscosity of ethereal oils important for their evaluation?** A. W. K. DE JONG AND M. VAN HARPEN. *Indische Mercur* 46, 139 (1923).—Adulteration of citronella oil by 10% or more coconut oil can be detected by detg. the relative viscosity. Various samples of citronella oil had a relative viscosity of 5.89–2.529, the lowest value being obtained with oil contg. the highest percentage of citronellal; the viscosity of pure citronellal is 1.791.

R. BRUTNER

**The determination of the benzoylcegonine, tropacocaine and ecgonine yields of the coca leaf.** A. W. K. DE JONG. *Indische Mercur* 46, 305 (1923).—The benzene ext. of the leaves is evapd., treated with 1%  $AcOH$  and then with alc. It is again taken up in benzene from which the benzoylcegonine crystallizes. Ecgonine is detd. in the remaining benzene soln. by polarization. To det. tropacocaine 50 cc. of the benzene ext. of the leaf is shaken with 5 cc. 0.1 *N*  $HCl$ , which is titrated with 0.1 *N*  $NaOH$  and litmus as indicator.

R. BRUTNER



The nicotine content of leaves and smoke of home-made untreated tobacco. H. RHODE. *Z. Nahr. Genussm.* 45, 112-5(1923).—The Konigsberg eye clinic reported a 6-times increase in eye disturbances due to nicotine over the war period. Analyses of home-made and commercial tobacco showed in the former more moisture and more ash but not a higher nicotine content. It was concluded that the poor combustibility of the home-made tobacco, due to high moisture and ash, results in less combustion and more volatilization of the nicotine. A higher concn. of it must therefore occur in the smoke.

Eau de Cologne as toilet water and therapeutic agent. J. J. HOFMAN. *Pharm. Weekblad* 60, 554-67(1923).—A review.

Methyl heptinecarboxylate and use of acetylenic esters in the perfume industry. L. VALLI-DONAN. *Am. Perfumer* 18, 133-4(1923).—The various steps involved in the prepn. of  $\text{CH}_3(\text{CH}_2)_4\text{C}:\text{CCO}_2\text{Me}$  (cf. Moureu and Delange, *Bull. soc. chim.* 29, 648(1903)) from castor oil to the finished product, and its use in conjunction with the ionones and Me ionones in replacing violet exts. are discussed.

Soap in dentifrices. J. R. McCLELLAND. *Am. Perfumer* 18, 163(1923).—A discussion of the use of soap and its probable influence on the secretions, mucosa, teeth and flora of the mouth.

Dentifrices and their action. E. G. THOMSEN. *Deut. Parfumerie-Zig.* 9, 7-8(1923).—Liquid preps. are first discussed in connection with 3 formulas for mfg. same, and their inadequacy in application as dentifrices is emphasized. The article concludes with a table showing the compn. of about 20 powders, pastes, soaps and liquids used as dentifrices.

Report on methods of qualitative and quantitative analysis of arspenamine (salvarsan) and nearspenamine (neosalvarsan). G. W. HOOVER AND C. K. GLYCAERT. *J. Assoc. Offic. Agr. Chemists* 6, 461-4(1923); cf. *C. A.* 16, 3166.—As a result of collaboration effected during the year, recommendations were made that (1) the qual. tests and quant. method No. 1 submitted for the examn. of arspenamine and nearspenamine be made official, (2) the quant. method No. 2 be made tentative with a view to further study for final adoption, and (3) during the next year methods to det. the ratio of As to N in arspenamine and nearspenamine be studied and devised by the referee.

New sedimentation tube and its use in determining the cleanliness of drugs and spices. ARNO VIEHÖVER. *J. Assoc. Offic. Agr. Chem.* 6, 466-72(1923).—The size of the tube (shown in cut) depends on the nature and amt. of material to be examd. Its efficiency is proved by the results obtained with various crude drugs and spices, enumerated in the report. Further work should be done to establish more definitely certain facts, e. g., the influence of fineness of powder in various types of material upon the final result and the compn. of the dirt, separable as residue in  $\text{CCl}_4$ , by standing as well as by centrifuging. The sepn. method (given in detail) is recommended as a rapid procedure to obtain a definite indication of the degree of purity.

Sublimation of plant and animal products—third report. ARNO VIEHÖVER. *J. Assoc. Offic. Agr. Chem.* 6, 473-81(1923).—Various types of app. are shown and described. The exptl. work on the improvement of sublimation app. led to the construction of a sublimation flask. This is an expensive app., permitting the sublimation of minute as well as fair-sized quantities of material. The task of definitely identifying the sublimate resulted in a notable improvement of an app., permitting the observation of the melting and subliming points under the microscope. The collaborative work has produced valuable suggestions in the improvement of the app. and demonstrated the fact that sublimation carried out by various workers under like conditions will yield like results.

Sources of cantharidin. I. *Macrobasis albida* Say. ARNO VIEHÖVER AND RUTH G. CAPEN. *J. Assoc. Offic. Agr. Chem.* 6, 489-92(1923).—The beetle, *Macrobasis albida* Say, abundant in Texas and Kansas, was found to contain both free (0.6 to 1%) and combined (4% and more) cantharidin, this material thus representing a possible domestic com. source of the drug. The eggs contain large, the heads small, amts. of cantharidin; the wings contain none.

West Australian sandalwood oil. B. SANJIVA RAO AND J. J. SUDBOROUGH. *J. Indian Inst. Sci.* 5, 163-76(1923).—The so-called W. Australian sandalwood oil is derived from *Fusanus spicatus*, R. Br., a tree quite different from *Santalum album*, Linn, the source of the East Indian oil. Distd. directly from the wood it differs considerably from genuine sandalwood oil, being outside the British pharmacopeial limits. By fractional distn., however, and removal of the lower b. sesquiterpene fraction it is possible to obtain an oil satisfying the B. P. tests for the genuine product, with the exception

of the value for ( $\alpha$ ), which is always below that required. Although it is easy by fractional distn. to obtain an oil containing more than 90% of alcohols calcd. as  $C_{15}H_{24}O$ , nevertheless they are not identical with either of the 2 santalols present in E. Indian oil but isomeric therewith. The W. Australian oil contains apparently 2 alcohols, isomeric santalols, termed  $\alpha$ - and  $\beta$ -fusanols, which yield phthalates and phenylurethans. From the fact that they react more slowly with phthalic anhydride than the santalols indicates that they are probably secondary and not primary alcohols, that from their mol. refractions both fusanols are bicyclic and contain 2 olefine linkings. The statement that during distn. of the oil under reduced pressure there is a loss of alcohols has not been confirmed; neither steam distn. nor distn. under reduced pressure appears to change the alc. content. It is generally agreed that for perfumery purposes the W. Australian oil is inferior to genuine sandalwood oil.

W. O. E.

**Extraction of caffeine.** H. E. WATSON, K. M. SHETH AND J. J. SUDBOROUGH. *J. Indian Inst. Sci.* 5, 177-207 (1923).—The distribution of caffeine in the tea plant is described and a number of analyses of tea fluff from different localities are given. The usual methods of prep. caffeine are outlined. A description is given of expts. on extn. from tea fluff by means of hot  $H_2O$ , which shows that the method is inefficient, that it is impossible to obtain concd. solns. of caffeine directly, that large quantities of  $Pb(OAc)_2$  are required, that at least 200 lbs. of  $H_2O$  have to be evapd. for every lb. of caffeine and that the losses are considerable. While it is possible to obtain caffeine from tea juice by the  $Pb(OAc)_2$  process, it is difficult to obtain good yields and it is doubtful whether this method would be of any com. value. The solubilities of caffeine in a no. of solvents at different temps. are given and it is concluded that  $C_6H_6$  and toluene, especially the latter, are suitable solvents for carrying out extns. on a com. basis. On treating tea fluff with a solvent not all the caffeine is dissolved, a state of equil. being set up owing to adsorption by the fluff, the latter assuming this condition with an aq. soln. contg. 1.3% of caffeine, that is, a soln. of this concn. will not dissolve any caffeine from tea fluff. If the latter is treated with  $CaO$  and 5 times its wt. of  $H_2O$ , only about 80% of the caffeine goes into soln. If 8 parts by wt. of toluene at the b. p. of  $H_2O$  are used as solvent, only 8% of the caffeine dissolves if the fluff is previously dried, but in presence of an alkali and a suitable quantity of  $H_2O$ , the proportion dissolved may be raised to over 70%. Caffeine is very appreciably decompd. on prolonged heating with  $CaO$  at temps. between 90° and 100° in presence of  $H_2O$  or toluene and  $H_2O$ . If the  $CaO$  is replaced by  $MgO$  the amt. of decompn. is lessened, while if  $Na_2CO_3$  is used the decompn. is very great. Caffeine is not readily extd. from dry tea fluff by means of volatile solvents. Good yields can be obtained by adding an alkali, preferably  $Na_2CO_3$ , and  $H_2O$ . It is thus possible on a small scale to ext. 95% of the caffeine in 3 hrs. with toluene as solvent. The best conditions for the extn. of caffeine on a larger scale are similar to those found in small scale expts. but a longer time is required for the process. A suitable method for obtaining pure caffeine from the crude exts. is described. The direct recovery of caffeine from tea fluff by distn. with superheated steam does not appear to be a practicable process.

W. O. E.

**Microchemical detection of alkaloids.** E. KRATZMANN. *Mikrokosmos* 16, 121-5 (1922-3).—A description with cuts of various procedures for the detection of the more common domestic alkaloids, as piperine, atropine, berberine, colchicine, caffeine, strychnine and brucine, chelidonium, and sanguinarine.

W. O. E.

**Evaluation of carbo medicinalis.** F. KOENIG. *Pharm. Zentralhalle* 64, 205-10 (1923).—The estn. and testing of medicinal charcoal are discussed from the standpoint of pharmacopeial and lab. requirements. The results obtained in the examn. of 6 samples are given in tabulated form, showing the  $H_2O$  and N content, adsorption of methylene blue and I,  $HCl$ -, alkali- and  $H_2O$ -sol. constituents, CN compds., "cubic weight" (10, 100 or 1000 cc.), and amt. of colloids in weakly alk. ext. It is suggested that, for the new German Pharmacopeia and the apothecary, decolorization with methylene blue and I solns., soly. in  $H_2O$  and  $HCl$ ,  $H_2O$ -sol. material in the ignition residue, CN compds. be resorted to as dependable tests.

W. O. E.

**Adulteration of santalin.** C. MASSATSCH. *Pharm. Zig.* 68, 348 (1923).—A sample of alleged santalin was found to consist of about 16.8% of the pure substance, the remaining material being artemisin (83.2%), a well known constituent of the mother liquor in santalin manuf.

W. O. E.

**Quality of potassium bromide.** J. FROMME. *Pharm. Zig.* 68, 348-9 (1923).—F. discusses the 3 com. forms, large crystals, granulated (trubliertes) and powd.  $KBr$ , emphasizing the necessity of testing the alky. notably of the large clear crystals.

W. O. E.

**Testing Peru balsam.** F. DIETZ. *Pharm. Zig.* 68, 349 (1923).—While the  $HNO_3$  test for this drug is regarded as valuable in the hands of those highly skilled in the

art, D. believes its general application as a pharmacopoeial reaction should be discouraged, on account of the uncertainty of the reagents employed, notably the petroleum benzene or ether (which must be  $C_4H_{10}$ -free). W. O. E.

**Fractional solution in the microscopical testing of drugs.** C. SITCH. *Pharm. Ztg.* 68, 349(1923).—The following is cited among others as an example of this procedure: Introduce a drop of cedar oil in a hollow-ground object glass, dust on with a brush a trace of cocaine-HCl, then from a pipet place a drop of abs. EtOH at the margin of the depression. Cocaine is immediately dissolved, while impurities like acetylsalicylic acid dissolve slowly, NaCl not at all. W. O. E.

**Properties of Bulgarian rose oil for the year 1920.** KHR. I. KYULYUMOV AND M. STEFANOVA. *Rev. agr. inst. recherches agr. Bulgare* 2, No. 1 & 2, 84-5(1921).—Since the compn. and properties of rose oil are profoundly influenced by both climate and soil, samples were drawn from different districts producing the oil. The investigations will be continued over 3 harvest years. The results obtained and tabulated approach those reported by Dietze (*Sueddeutsche Apoth. Ztg.* 1897, No. 89; *Chem.-Ztg.* 21, 288(1897), and Petkoff (*Chem.-Ztg.* 22, No. 17(1898)); they differ, however, from Raikoff's findings (*Z. offenl. Chem.* 1914). The constns. of 5 samples showed the following range:  $d_{16}^{20}$  0.8533–0.8589, solidifying point 15.8–21.5,  $[\alpha]_D^{25}$  42.85–61.45°, polarization in 100 mm. tube  $-1.68$ – $-4.06^\circ$ , acid no. 0.78–1.51, ester no. 7.38–10.25, sapon. no. 8.16–10.85, Ac. no. 213.9–232.78, free alcohols as geraniol 66.17–73.79, total alcohol as geraniol 68.94–76.25. W. O. E.

**Reports on biological standards. I. Pituitary extracts.** J. H. BURN AND H. H. DALE. *Med. Res. Coun., Special Rept. Ser.* 1922, No. 69; *Physiol. Abstracts* 7, 812-3.—By using the isolated uterus of the virgin guinea pig as a test for making quant. estns. of pituitary exts., it is found that the only suitable standard for comparison is a prepn. of the pituitary ext. itself. Chem. substances such as histamine or KCl are of no use, because the sensitiveness of different uteri vary differently towards a pituitary extract on the one hand from the variation to histamine or KCl. It is shown that, unlike the suprarenal gland, in which the amt. of active principle varies in different animals, the pituitary glands of oxen contain approx. the same amt. of activity per g. of material, even though the glands are obtained at different seasons of the year. Consequently, provided the process of obtaining and extg. the glands is kept const. in all details, an ext. of fresh glands may serve as a standard of reference for com. exts. made by large-scale methods. A considerable part of the variation observed in com. exts. at present on the market is due to the fact that different manufacturers make exts. of different strengths. It is recommended that all exts. should be 10%. H. G.

**The Santalaceae and sandalwood: distribution and uses (I).** C. GROUP. *Parfumerie Moderne* 14, 196-7(1921); *Bull. Agr. Intelligence* 13, 72-6.—Sandalwood oil is obtained from these woods by distn. The yield ranges from 1.5 to 5%. The oil is of a more or less light shade of yellow; its smell is faint, but clinging, resembling the scent of the rose; it has a disagreeable pungent flavor. In this essential oil have been found: ethers; two levorotatory alcs. (santalols), with the formula  $C_{15}H_{26}OH$ ; one aldehyde (santalal), with the formula  $C_{15}H_{24}O$ ; one carbohydrate (santalene) boiling at  $252^\circ$  or  $252.5^\circ$ ; another santalene boiling at  $261^\circ$  or  $262^\circ$ ; a carbohydrate boiling at  $130^\circ$  or  $140^\circ$ ; santalic acid an oxygenated product to which is due the special smell of the essence and boiling at  $210^\circ$  or  $220^\circ$  ( $C_{15}H_{24}O_6$ ). As santalols ought to make up 94% of the essential oil, it is easy to detect any adulteration by detg. the amt. of these substances; should the santalol content sink below 90%, the oil is no longer pure, but no fraud need be suspected if the percentage is above this figure. The essential oil of the West Indies is prepd. from certain Rutaceae (*Amyris balsamifera* and others), growing in Venezuela and tropical America. It has a far less delicate scent than sandalwood oil. *Amyris balsamifera* is the balsam of Jamaica, where it is usually known as rose wood; it is the candle wood of Guadeloupe. The essential oil is not only used in perfumery, but also in medicine. H. G.

**Cultivation of the opium poppy in Bulgaria and Macedonia.** M. NIKOLOFF. *Rev. Inst. Agron. Res. Bulgaria* 2, 217-41(1922); *Bull. Agr. Intelligence* 13, 1123.—The Bulgarian poppy products (seed, oil, opium) are of excellent quality. The seeds are very rich in oil up to 49% and the opium in morphine as of 119 samples of opium analyzed 27.8% contained 10 to 15% of morphine; 41%, 15 to 17%; 21.3%, 17 to 19%; and 6.8%, 19 to 21%. The poppy in which an early incision is made generally contains a higher percentage of the narcotic. In opium kept a long time, the morphine content diminishes even when every care is taken. The manuf. of poppy oil is defective in Bulgaria; the oil-cake contains 8 to 19% of oil. H. G.

**A method for the colorimetric estimation of arsphenamine and neoarsphenamine.**

**HERMANN WHYL.** *Klin. Wochschr.* 2, 745(1923).—Nine vols. of the liquid to be tested are mixed with 1 vol. of a slightly warm 1% soln. of gelatin and 30 vols. of a reagent composed of 0.10 g. of  $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CHO}$  dissolved in 20 cc. of 0.1  $N$  HCl. The gelatin acts as a protective colloid and prevents the formation of a ppt. with concd. solns. Colorimetric comparisons are made with standard arsphenamine or neoarsphenamine solns. that have been prepd. as above.

MILTON HANKE

**Papaw and papain.** **ELLIS THOMAS AND V. A. BECKLEY.** *J. Dept. Agr. Union S. Africa* 6, 357-60(1923).—The enzyme, papain, which possesses the power of digesting protein materials is obtained from the papaw fruit, in the form of a white or creamy powder of characteristic pungent odor, by scratching the rind of the well developed green fruit with an ivory, bone, or wooden knife. The latex is collected in a glass or china vessel and allowed to coagulate to a pure white curd which is spread out in thin layers on glass plates and rapidly dried, preferably by artificial heat, at a temp. below  $100^\circ\text{F}$ . Contact with metals during the process of prepn. results in a discolored product of little com. value.

K. D. JACOB

**Determination of total geraniol content of citronella oil.** **M. S. SALAMON.** *Perfumery Essent. Oil Record* 13, 357-8(1922).—A criticism of the paper by de Jong and Reclaire (*C. A.* 17, 180). It is pointed out that the equiv. of 0.1 cc. of 0.5  $N$  KOH is 0.0075 g. of geraniol and not 0.075 g. as stated. The importance of accurately measuring the volumetric soln. is emphasized, as a difference of 0.1 cc. of 0.5  $N$  KOH represents a difference of 0.8% in geraniol content. As the acetylated oil is somewhat dark it is not considered possible to neutralize it accurately with 0.5  $N$  KOH by dissolving 1.5 g. in only 2 cc. of alc., and 20 cc. of 0.5  $N$  KOH is not considered sufficient to provide an adequate excess in the sapon. of 1.5 g. of acetylated oil. Attention is drawn to the influence of chlorides in the  $\text{Ac}_2\text{O}$  used for acetylation, expts. indicating that an anhydride contg. chloride may increase the so-called geraniol content by as much as 2.5%.

J. S. C. I.

**White mice and the assay of insulin.** **D. T. FRASER.** *J. Lab. Clin. Med.* 8, 425-8(1923).—Starved white mice are very susceptible to the action of insulin injected intraperitoneally. Two types of reaction ensue, ataxic and convulsive. In a typical reaction the animal recovers within 5 min. after the intraperitoneal injection of 0.25 cc. of 15% dextrose. Mice fed immediately after the injection of insulin are very tolerant of its effect. The correlation of the unit, as detd. by the use of rabbits with the unit as detd. by the use of mice, is attempted; 0.0025 cc. is approx. the equiv. of 5 rabbit units per cc.

B. R. LONG

**Oil of neroli.** **G. ROMEO.** *Riv. Ital. ess. profum.* 4, 98-100(1922); *Chimie et industrie* 9, 750(1923).—Oil of neroli obtained by distn. of bitter orange blossoms (*Citrus bigaradia*, Risso) contains  $l$ - $d$ -pinene,  $l$ -camphene, dipentene, decyl aldehyde, jasmone, esters of phenylacetic acid and  $\text{BzOH}$ ,  $l$ -linalol, linalyl acetate, geraniol, nerol, nerolidol, phenylethyl alc.,  $d$ -terpineol, indole and methyl anthranilate (0.45-1.10%). The total alc. content does not exceed 50%. It is slightly fluorescent, yellow and turns brown in time;  $d_{20}^4$  0.870-0.881;  $[\alpha]_{20}^{25}$   $1^\circ30'$ - $5^\circ$  (occasionally  $9^\circ$ );  $n_D^{20}$  1.468-1.474; acid no. 1.8. Methyl anthranilate is the base of cheap synthetic substitutes.

A. PAPINEAU-COUTURE

**Sulfur content of arsphenamine and its relation to the mode of synthesis and the toxicity.** **IV. WALTER G. CHRISTIANSEN.** *J. Am. Chem. Soc.* 45, 1316-21(1923); cf. *C. A.* 17, 80.—The use of pure instead of com.  $\text{Na}_2\text{S}_2\text{O}_4$  for the reduction of 4,3- $\text{HO}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{AsO}_2\text{H}_2$  or the  $\text{NH}_3$  acid to arsphenamine results in a greater rate of reduction, a larger yield and a higher S content. These factors are controlled by the acidity of the reduction mixt. and the addn. of  $\text{Na}_2\text{CO}_3$  to pure  $\text{Na}_2\text{S}_2\text{O}_4$  slows down the rate of reduction, decreases the yield and lowers the S content. The use of  $\text{AcOH}$  with com.  $\text{Na}_2\text{S}_2\text{O}_4$  has the opposite effect. Earlier conclusions regarding the distribution of S in arsphenamine are substantiated. The ease of soln. of arsphenamine in  $\text{H}_2\text{O}$  depends partly upon the acidity of the reduction medium during the formation of the base; specimens prepd. with pure  $\text{Na}_2\text{S}_2\text{O}_4$  are much more readily sol. than those made with the com. salt.

C. A. R.

**Nicotine in tobacco smoking mixtures.** **BJARNE SAMDAHL.** *Norsk Farma Tids.* 30, 306-11, 325-9(1922).—A discussion of the various methods for detg. nicotine in tobacco. The author gives the results of some detns. in various Norwegian and foreign mixts., the samples in each case being taken from a single tin or packet. The figures vary from 0.70% in a mild long-pipe tobacco to 3.92% in a carved chewing-tobacco. The English "Craven" contained 2.48%, "Capstan Navy Cut" 2.93%, and "Central Union Cut Plug" 1.31% nicotine.

CHR. H. A. SYVERTSEN

The ethereal-oil-containing plants of the Dutch East Indies and the preparation

of these oils. A. W. K. DE JONG. *Ber. van de Afd. Handelsmuseum van het Koloniaal Inst. No. 7*, 183 pp.; *Ind. Mercur* 1922.—The various ethereal oils and their occurrence are discussed and then the various methods of obtaining them from the plants. The various groups of plants contg. the ethereal oils which may be or are being used as perfumes or for pharmacol. or tech. purposes are then named. The methods of planting, fertilizing and prepg. these plants are outlined as well as the prepn., purification, packing, cost and uses of their oils.

**Chemical examination of *Ceanothus velutinus*.** E. V. LYNN, F. A. LEE and W. H. CLAUSEN. *J. Am. Pharm. Assoc.* 12, 419-20(1923).—Leaves of *Ceanothus velutinus* Rhamnaceae were dried in the air. Petr. benzine extd. 8.18%. Following this Et<sub>2</sub>O extd. 7.31%; ash 3.75%. Steam distn. gave 0.1% of a brown oil, calcd. to fresh material.  $d_{20}$  1.0125;  $n_D^{20}$  1.5315; b. p. 218°; 20% sol. in H<sub>2</sub>O; 55% sol. in dil. KOH; 15% sol. in NaHSO<sub>4</sub>. Cinnamaldehyde was the only constituent identified.

L. E. WARREN

Wax paper for packing hygroscopic tablets (GRÜNEWALD) 23. Ether analysis (KAUSE) 11B. Hg derivative of diallylmalonic acid (U. S. pat. 1,457,675) 10. Aromatic organic Hg compounds (U. S. pat. 1,455,495) 25.

**Medicinal mercury preparations.** SNEYDEL MFG. CO. Brit. 189,790, Nov. 29, 1922. Suspensions or colloidal solns. of metallic Hg for intravenous injection are prepd. by grinding Hg with a sol. or partially sol. carbohydrate such as gum acacia, dextrose, or partially hydrolyzed starch. A basic substance, such as NaOH, and NaCl may be added. Preferably a powd. or pasty medium is used and the prepn. dild. with H<sub>2</sub>O immediately before use. The mixts. are triturated by means of non-metallic pestles and mortars or in a rotating non-metallic pebble mill. The media used are stated to be assimilable by and isotonic with normal blood.

**Menthhol; isomenthol; menthone.** RHINISCHE KAMPFER-FABRIK GES. Brit. 189,450, Nov. 20, 1922. By hydrogenizing thymol under pressure in the presence of a catalyst such as Ni, Co, Pt, or Pd, a mixt. of menthol and isomenthol is obtained, from which the menthol seps. on cooling. The isomenthol remaining is dehydrogenized into menthone by the aid of a catalyst such as CuO or NiO, and the menthone, alone or in admixt. with thymol, is then hydrogenized under pressure to produce more menthol. The menthol obtained by the process has the properties of natural inactive menthol.

**Stable therapeutic arseno compounds.** W. KOLLE. U. S. 1,454,748, May 8. Antiparasitic compds. of relatively low toxicity, adapted for use as therapeutic agents, are prepd. by reaction between arsenobenzene derivs. and aminsulfoxylate derivs. other than arseno compds., e. g., 4-arsenodi-1-phenyl-2,3-dimethyl-4-amino-5-pyrazolone, bismethylaminotetraaminoarsenobenzenecarbamate and *p*-aminophenolmethylsulfoxylate (the product of which has a toxicity of only about 1/40 that of either of the components). Numerous examples of reaction mixts. are given, some of which include Ag compds. such as the Ag deriv. of 4,4'-dihydroxy-3,3'-diaminoarsenobenzene.

**Purification of aromatic aminoarsinic acids.** KAORU MATSUMIYA. Japan. 41,346, Dec. 27, 1921. Coloring matter and org. bases accompanied by aminophenyl-, aminoalkylphenyl-, aminonaphthyl-arsinic acids, etc., are removed by treating with Japanese acid clay. E. g., crude aminophenylarsinic acid, prepd. from PhNH<sub>2</sub> and arsenic acid, is subjected to steam distn. to free it from PhNH<sub>2</sub> and the resulting soln., contg. about 5% of the acid, is neutralized with Na<sub>2</sub>CO<sub>3</sub> or NaOH until slightly acidic. Ten l. of the soln. is mixed with 500 g. of Japanese acid clay, agitated thoroughly and filtered after 2-5 min., or the soln. is passed through a layer of the clay in a suitable app. The soln. is almost colorless and free from PhNH<sub>2</sub>.

**A therapeutic compound of tannin and yeast.** R. BERENDES and F. LANGE. U. S. 1,454,372, May 8. A therapeutic compn. for treatment of catarrhal affections of the intestines is prepd. by heating yeast with tannin in H<sub>2</sub>O for 3-6 hrs. at 40-50°, neutralizing, sepg. the ppt. and drying it at 105-120°. The product is a grayish powder difficultly sol. in H<sub>2</sub>O and in org. solvents but more sol. in alkalis. It has an agreeable taste.

**Porous water-soluble effervescent compositions.** J. FELC. U. S. 1,450,865, Apr. 3. Mixts. such as those contg. Na<sub>2</sub>CO<sub>3</sub>, citric acid and a bromide or other therapeutic agent are mixed with sirup and heated to cause evolution of about 10% of the total amt. of CO<sub>2</sub> which the mixt. is capable of producing, then cooled to check the reaction and mixed with sugar or other diluent to prep. a hard, dry porous effervescent product. If effervescence of the product is not desired, the heating may be prolonged to evolve

all the  $\text{CO}_2$  in the preliminary reaction. Effervescent products prepd. in this manner are very stable until treated with  $\text{H}_2\text{O}$  at the time of use.

**Vaccine.** E. R. WHITMORE. U. S. 1,457,097, May 29. A vaccine is prepd. by propagating the organisms, *e. g.*, pneumococcus, attenuating and sedimenting them, freezing, drying, grinding in lanolin or other anhyd. material and finally grinding in neutral sterile anhyd. oil to discrete or sep. without killing the living organisms but individually to coat and suspend them in the oil, *e. g.*, cottonseed oil.

**Veterinary medicines.** F. C. MASTERS and J. M. MORRIS. Brit. 189,828, July 6, 1921. An internal remedy for treating distemper in dogs, and for other veterinary purposes, consists of Stockholm tar, castor oil, Epsom salts, black sulfur, yellow sulfur, soap, lard, mutton fat and black gunpowder. The remedy is administered with lard or butter to render it palatable.

**Absorbent mass for tooth paste.** EINAR BERGVÆ. Norw. 34,811, May 1, 1922. A plastic mass is formed from  $\text{SiO}_2$  with addn. of adequate amts. of  $\text{H}_2\text{O}$  or alc. This is physiologically indifferent compn. in contrast to the usual alk. masses.

**Scouring substance for tooth paste.** AKTJESLSKAPET AZAL. Norw. 35,978, Oct. 16, 1922.  $\text{BaSO}_4$  in the form of finely ground heavy spar or pptd.  $\text{BaSO}_4$  is used.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

**Automatic regulation of the amount of oxidizer introduced into sulfuric acid chambers.** KAI WARMING. *Chimie et industrie* 9, 671-3(1923).—The regulation depends on the difference between the temp. of the gas entering the first chamber and of the gas leaving the last chamber. The amt. of  $\text{NO}_2$  is regulated by means of a suitable valve or cock operated electrically with a temp. difference of  $\pm 1^\circ$  from the desired temp. difference. The temp. difference can range from  $25^\circ$  to  $60^\circ$ .

A. PAPINEAU-COUTURE

**The manufacture of bleaching powder.** OTTO NYDRØGER. *Industrie chimique* 10, 151-3(1923); *World's Paper Trade Rev.* 79, 1822, 1824(1923).—N. found that the heat of reaction in the manuf. of bleaching powder is 265 cal. per kg. of Cl. He outlines a scheme of continuous manuf. using electrolytic Cl. The Cl is diluted to about 20% with air, passed through a long almost horizontal cylinder through which lime passes in the opposite direction, at such a rate that the temp. does not rise above  $50^\circ$ , passed through a cooler to reduce it to about  $20^\circ$ , and finally sufficient Cl is added to make up for the amt. absorbed by the  $\text{Ca}(\text{OH})_2$ , and the cycle is repeated.

A. PAPINEAU-COUTURE

**Preparation of pure zirconium oxide.** H. VON SIEMENS AND H. ZANDER. *Wiss. Veröffentl. Siemens-Konzern* 2, 484-8(1922).—Brazilian zirconia (67.8%  $\text{ZrO}_2$ , 22.2%  $\text{SiO}_2$ , 8.7%  $\text{Fe}_2\text{O}_3$ ,  $\text{TiO}_2$ ) mixed with 25% of charcoal was heated at  $1000$ – $1200^\circ$  in a stream of Cl, and the mixt. of chlorides evolved collected in a fireclay vessel. Complete reduction was not effected, only about 80% of the zirconia being reduced. There appeared to be no catalysis due to the presence of Fe and Ti. The phys. condition of the ore appears to play some part in the reduction, as slightly ignited zirconia powder is readily reduced, while powd. sintered fragments are not reduced. The mixt. of chlorides obtained is dissolved in water and the soln. evapd. to incipient crystn. The crystals of  $\text{ZrOCl}_2$  thus obtained are preferably washed with a mixt. of alc. and concd. HCl in equal proportions, or alternatively, the crystals are slaked with water until completely hydrated and no further evolution of Cl occurs. The hydrated mass is dissolved in the hot alc.-HCl mixt. and the soln. crystd. by cooling. The crystals are ignited in air in order to obtain pure Zr oxide. J. S. C. I.

**The chlorine industry in the United States.** P. S. BRALLIER. *Chem. Met. Eng.* 28, 846-9(1923).—The daily Cl-producing capacity of the U. S. is 300 tons, and the daily consumption less than 200. Several years of competition have failed to produce a remedy. It is suggested that Cl mfrs. combine to initiate research to increase the use of Cl, thereby putting to use instead of scrapping many million dollars worth of idle plant. F. C. Z.

**Production of hydrogen by the thermal decomposition of oil.** E. R. WHAYER. *Chem. Met. Eng.* 28, 939-45(1923); cf. C. A. 17, 2173.—W. discusses the purity of the gas obtained in the exptl. manuf. of H and shows CO to be the principal impurity. The possible sources of CO are narrowed down to: decompn. of  $\text{H}_2\text{O}$  from the lining, and to the presence of  $\text{Fe}_2\text{O}_3$ . Proofs are offered to limit the sources of CO. An approx.

thermal balance, indicated in a table, shows the very poor efficiency of the process and indicates the direction in which to work for improvement. W. H. BOYNTON

**The industrial problem of nitrogen.** GARTANO CASTELLI. *Rass. min. met. chim.* 58, 81-4 (1923).—From a survey of the various processes for the fixation of N, it is concluded that none is wholly suitable for development as the chief source of N in Italy. C. C. DAVIS

**The thermal theory of the distillation and rectification of air.** P. MION AND L. GAY. *Chimie et industrie* 9, 463-8, 674-84 (1923).—An application of G.'s thermal theory of distn. and rectification (cf. C. A. 14, 1479, 3355; 15, 908; 16, 1039) to the sepn. of O and N from liquid air, comparing the Linde, Claude and Pictet processes. The first is far inferior to the others, the last has some considerable advantages over the Claude process. The reasoning being based on the theoretical assumption that the app. is perfect, cannot be quantitatively exact, but is probably qualitatively correct. A. PAPINEAU-COUTURE

**Production and uses of lamp black and of carbon black.** REX FURNESS. *Chem. Age* (London) 8, 532-4 (1923). R. H.

**Utilization of waste rock at lime plants.** OLIVER BOWLES. *Bur. of Mines, Repts. of Investigations* No. 2463, 5 pp. (1923).—B. discusses limitations of lime kilns, and lime plant losses and suggests possible uses of waste rock. These include fluxing stone, road stone, ballast, concrete aggregate, fine aggregate, chicken grit, agr. limestone, and filler and whitening substitute. W. H. BOYNTON

**Litharge-glycerol cements.** A. CHAPLET. *Rev. chim. ind.* 32, 124 (1923).—The hardest cement is obtained by mixing 50 g. of PbO with 5 cc. of glycerol; but owing to the rapidity of setting it is preferable to use 50 g. of PbO and 6 cc. of a mixt. of 5 vols. of glycerol and 2 vols. of H<sub>2</sub>O. The mass becomes appreciably hard in 10 min. and quite strong after 3 hrs. A. PAPINEAU-COUTURE

**Sulfuric acid.** W. F. LAMOREAUX. U. S. 1,456,064, May 22. SO<sub>2</sub> is oxidized in the presence of H<sub>2</sub>O while alternately and repeatedly dispersing the liquid phase into the gaseous phase and recollecting it. The oxidation may be effected by nitrous gases. U. S. 1,456,065 relates to a similar process in which the amt. of H<sub>2</sub>O present is insufficient to unite with all of the SO<sub>2</sub> formed.

**Sulfuric acid.** T. R. HARNEY. U. S. 1,457,164, May 29. N oxides are introduced into sulfurous gas and the latter is oxidized while the mixed gases are conducted through a long circuitous passage, H<sub>2</sub>O is then added from an external source and the mixt. is subjected to scrubbing action in contact with large surfaces to form H<sub>2</sub>SO<sub>4</sub>. The latter is sepd. and the residual gases are further treated.

**Concentrating sulfuric acid.** F. G. STANTIAL. U. S. 1,457,676, June 5. Conc. and denitrating towers are supplied with acid directly from the same source and with hot gases from the same source, in an app. provided with devices for controlling the ratio of acid to hot gases.

**Hydrochloric acid.** G. POMA and G. ANDREANI. *Brit.* 189,723, May 19, 1922. A plant for the synthetic production of HCl, in which a mixt. of Cl and H<sub>2</sub>O vapor is passed over incandescent coke, comprises essentially a furnace having two compartments, the Cl and H<sub>2</sub>O vapor being mixed in the one compartment before passing into contact with the coke in the other, and cooling and condensing towers.

**Hydrofluoric acid, fluorides and fluosilicates.** S. S. SVENDSEN. *Norw.* 33,782, Jan. 9, 1922. If CaF<sub>2</sub> is fused with a silicate, SiF<sub>4</sub> is formed according to the following equations: (1) 2CaF<sub>2</sub> + 3SiO<sub>2</sub> = SiF<sub>4</sub> + 2CaSiO<sub>3</sub>, and (2) 2CaF<sub>2</sub> + SiO<sub>2</sub> = SiF<sub>4</sub> + 2CaO. If H<sub>2</sub>O vapor is added, the reaction will follow the equations: (3) 3CaF<sub>2</sub> + SiO<sub>2</sub> + H<sub>2</sub>O = H<sub>2</sub>SiF<sub>6</sub> + 3CaO, and (4) 3CaF<sub>2</sub> + SiO<sub>2</sub> + 3H<sub>2</sub>O = 6HF + CaSiO<sub>3</sub> + 2CaO. By regulating the quantity of H<sub>2</sub>O vapor one may obtain either H<sub>2</sub>SiF<sub>6</sub> or HF as main product. As raw material impure SiO<sub>2</sub> contg. CaO can be used.

**Formic acid and ammonium formate.** NORSK HYDRO-ELEKTRISK KVAELSTOF-AKTIESELSKAB. *Norw.* 34,668, Apr. 18, 1922. Technical Ba(CN)<sub>2</sub> contg. some BaCN<sub>2</sub> and C is decompd. in autoclaves by H<sub>2</sub>O under addn. of CO<sub>2</sub>. The Ba is pptd. as BaCO<sub>3</sub> and the formed HCO<sub>2</sub>H can be obtained as HCO<sub>2</sub>NH<sub>4</sub>. Some extra NH<sub>3</sub> may be added if it is necessary for complete pptn. of the BaCO<sub>3</sub>.

**Mixture of hydrogen and nitrogen for synthesis of ammonia.** NORSK HYDRO-ELEKTRISK KVAELSTOF-AKTIESELSKAB. *Norw.* 35,049, June 19, 1922. By action of H<sub>2</sub>O on sulfides, for instance pyrite, at high temp. a gas consisting of H, H<sub>2</sub>S, SO<sub>2</sub>, and S is obtained. S and its compds. are sepd. by cooling and treating with H<sub>2</sub>O and alkalis, e. g., lime. By roasting pyrite in another furnace a mixt. of N, SO<sub>2</sub> and O is

obtained. This is freed from  $\text{SO}_2$  as above mentioned. The O is absorbed by treating with sulfites, which can be produced from an adequate amt. of the  $\text{SO}_2$  formed.

**Catalyzer for ammonia synthesis.** NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 35,852, Oct. 9, 1922. Cf. C. A. 16, 471, 1137. The catalyzer is prepd. by heating in indifferent atm. a mixt. of cyanides contg. not more than 2 mols. of cyanides of light metals to each mol. of heavy-metal cyanide.

**Oxidation apparatus for ammonia.** DENGORO MORI. Japan. 41,275, Dec. 27, 1921. Addn. to 35,618 (C. A. 14, 3132). The app. is constructed by combining 2 app. described in the former patent, symmetrically and concentrically for utilizing heat and simplifying the operation.

**Barium sulfate and sodium hydrosulfide.** J. B. PIERCE, JR. U. S. 1,457,934, June 5. Double decompn. is effected between BaS and  $\text{Na}_2\text{SO}_4$ .  $\text{NaHSO}_4$  is substantially neutralized with at least a portion of the resulting Na sulfide and the  $\text{H}_2\text{S}$  thus formed is absorbed in another portion of Na sulfide obtained from the first reaction. U. S. 1,457,935 specifies effecting double decompn. between solns. of BaS and  $\text{Na}_2\text{SO}_4$  while maintaining the temp. at  $50\text{--}100^\circ$  to obtain pptd.  $\text{BaSO}_4$ .

**Purifying barium sulfate.** A. L. A. TEILLARD. U. S. 1,456,949, May 29. Native  $\text{BaSO}_4$  ore is ground and heated to split up the pure crystals and leave the impure crystals and the disintegrated pure material is sepd. by sifting. The heating may be at a temp. of about  $300^\circ$ . Cf. C. A. 17, 187.

**Mercuric chloride from mercury and chlorine.** K. D. M. VAN LIER. Holl. 8480, Nov. 25, 1922. Modification of Ger. 262,184 (C. A. 7, 3398). In a revolving reservoir contg. a fluid in which  $\text{Cl}_2$  is practically insol. ( $\text{H}_2\text{O}$  or a soln. of  $\text{HgCl}_2$ ) the Hg is added and also  $\text{Cl}_2$  under pressure. By revolving the reservoir the Hg is thrown through the  $\text{Cl}_2$  forming  $\text{HgCl}_2$  which is dissolved in the water. The temp. is kept above that at which  $\text{HgCl}$  will form, but is prevented from going too high by the const. addn. of a cooler soln. of  $\text{HgCl}_2$ . At the end of the process the  $\text{HgCl}_2$  crystallizes out on cooling and the remaining soln. is used over again for the same procedure.

**Lead sulfate.** J. GITSHAM and H. R. EVERSHED. Brit. 189,160, May 31, 1921. The invention is related to the process described in 5299, 1915 (C. A. 10, 2533) wherein sulfate, sulfite, and oxide of Pb are obtained directly from the native sulfide by volatilizing the latter in an elec. furnace. The present invention aims at the production of a product free from sulfite, oxide, or unchanged sulfide. A suitable construction is specified.

**Thorium and rare-earth sulfates.** SOC. MINIERE ET INDUSTRIELLE FRANCO-BRESILIENNE. Brit. 189,698, Feb. 9, 1922. Phosphate ores of Th and rare earths such as monazite are decomposed by strong  $\text{H}_2\text{SO}_4$  and the insol. sulfates are sepd. mechanically from the liberated  $\text{H}_3\text{PO}_4$ , the sulfates being freed from remaining  $\text{H}_3\text{PO}_4$  by washing with strong  $\text{H}_2\text{SO}_4$ , after which the washings are used for treating a fresh batch of ore. The Th is sepd. from the mixed sulfates in the known ways. Alternatively the reaction mass may be diluted with dil.  $\text{H}_2\text{SO}_4$  which causes most of the Th to dissolve, while a part of the Th and the rare earth sulfates remain insol. in a cryst. condition. The Th, sepd. from the rare earths in the known manner, is added to the acid soln. and Th sulfate is subsequently recovered by concg. the soln.

**Sodium fluosilicate.** H. HOWARD. U. S. 1,456,594, May 29. Phosphate rock is treated with  $\text{H}_2\text{SO}_4$ , the soln. formed is sepd. from insol. material and a sufficient amt. of  $\text{Na}_2\text{CO}_3$  is added to the soln. to convert the crude  $\text{H}_3\text{PO}_4$  (contg. F compds.) into the mono-alkali salt. The resulting ppt. of  $\text{Na}_2\text{SiF}_6$  is recovered.

**Potassium sulfate from clay.** EUGEN WANG. Norw. 36,038, Oct. 23, 1922. By the usual decompn. by  $\text{H}_2\text{SO}_4$  of clay contg.  $\text{K}_2\text{O}$  potassium alum is obtained. The alum is decompd. by heating, whereby  $\text{K}_2\text{SO}_4$  and  $\text{Al}_2\text{O}_3$  are formed. An adequate amt. of  $\text{K}_2\text{SO}_4$  is used again to ppt. additional amts. of alum, while the rest is gained as a by-product.

**Phosphates.** RYUICHI HAYASHI and THE TAISEI KWAGAKU KOGYO KABUSHIKI KAISHA. Japan. 41,223, Dec. 22, 1921. Insol. Al or Fe phosphate ores are made sol. in citric acid or ammonium citrate. The mineral is put into a heated rotating or muffle furnace and heated for 30 min. at  $400\text{--}700^\circ$  according to the condition. Then the contents are quickly cooled by blowing cold air or transporting them through a cooled tube and dissolved in citric acid or ammonium citrate, about 95% being dissolved in the former and about 70% in the latter. From these solns.  $\text{NH}_4$ , K, or Ca phosphates are easily isolated.

**Soluble phosphates.** SEN KAWAMURA. Japan. 41,224, Dec. 22, 1921. 100 parts of powd. Fe or Al phosphate ore are boiled and then evapd. to dryness with 11 parts of NaOH, 27 parts of  $\text{Ca}(\text{OH})_2$ , and 100–150 parts of  $\text{H}_2\text{O}$ . The residue is powdered. By



this treatment 77% of the total phosphoric acid is dissolved in 2% citric acid or ammonium citrate. As the product is not hygroscopic, it is used for fertilizer and material for manuf. of other phosphates.

**Treating alunite.** E. MOLDENKE. U. S. 1,457,787, June 5. Finely divided alunite is treated with more than sufficient  $H_2SO_4$  to convert the Al into sulfate, forming a paste, the mixt. is heated until it forms a brittle cake and after the material is disintegrated it is introduced into a closed chamber and heated to cause evolution of fumes from the free acid present and render the values sol. in  $H_2O$ . The heating and hardening of the pasty mixt. may be carried out on a sheet-metal flexible conveyor the flexing of which serves to break the caked material and dislodge it from the conveyor. Clay and bauxite when treated with  $H_2SO_4$  may be similarly handled.

**Pure molybdenum oxides.** B. BROCH. Norw. 35,804, Oct. 2, 1922. Briquetted Mo sulfide concentrate is treated with dry O at  $1100-1500^\circ$  in a completely closed app. Mo oxides are obtained directly.

**Pure molybdenum compounds.** ANDREAS RODLAND. Norw. 33,720, Jan. 2, 1922. Mo sulfides, preferably in grain sizes from 0.1 to 3.0 mm., are decompd. by  $HNO_3$  in amts. insufficient for complete decompn. in order to avoid considerable losses of N. The molybdic acid formed being insol. in  $H_2O$  and dil. acids, the charge is freed from sol. salts of foreign metals by washing, whereupon the molybdic acid is extd. by treating with  $NH_4$  or alkalis. The residue is again treated with  $HNO_3$  to ext. the last residues of Mo.

**Pure molybdenum products.** SIGURD WESTBERG and EMIL EDWIN. Norw. 34,454, Mar. 27, 1922. The briquetted ore is reduced by H and is then burned with O in a closed room.  $MoO_3$  distils over into a condenser, whereas the impurities are retained. Only an initial heating is required as the heat of reaction is sufficient to cover the heat losses. The applied O must be rather pure.

**Fine granules of aluminium.** HIDEGORO AKIYAMA. Japan. 41,222, Dec. 22, 1921. Melted Al is gradually flowed down through a heated funnel, at the orifice of which compressed cold  $H_2O$  is blown into the stream of metal, by which Al is scattered into fine particles and the heat of the metal is taken away by the  $H_2O$ . Thus fine particles of Al are produced without causing much oxidation.

**Precipitation of iron from alumina solutions.** AKTIESELSKAPET LABRADOR. Norw. 34,492, Mar. 27, 1922. It has appeared that in order to get a quant. pptn. of  $Fe_2O_3$ , aq. from  $Al_2O_3$  solns. the catalyzing Fe hydroxides must be activated by treatment with liquids of higher H-ion concn. than that at which Fe can be quant. pptd. This can be attained by adding the catalyzing Fe hydroxide to the acid  $Al_2O_3$  soln. whereby it is activated, and accordingly neutralizing the soln., whereby the Fe is quant. pptd.

**Selenium crystals.** F. C. BROWN. U. S. 1,456,532, May 29. Se adapted for use in Se bridges is prepd. by freeing Se from occluded gases, vaporizing it *in vacuo* and depositing crystals from the vapor.

**Decomposition by acids of siliceous alumina compounds.** AKTIESELSKAPET HOYANGFALDENE, NORSK ALUMINIUM Co. Norw. 35,193, July 3, 1922. Clay is treated with  $H_2SO_4$  in a rotary drum coated with acid-resisting material. The acid is applied dropwise in amts. somewhat insufficient for complete decompn. Practice shows that  $Al_2O_3$  is still completely liberated. Heat is produced by the reaction. Accordingly the mass is passed through a heated drum where the temp. is kept above  $140^\circ$  but not so high that decompn. of Al sulfate takes place. By the following extn. Al sulfate (and Fe sulfate) is obtained in the soln. and the remaining undissolved  $SiO_2$  is easy to filter.

**Sulfides from sulfates.** H. HOWARD and E. B. ALVORD. U. S. 1,457,436, June 5. A metal sulfate, e. g.,  $BaSO_4$ , in a finely divided condition is reduced to sulfide while suspended in a reducing atm. at a high temp.

**Sulfur from sulfide ores.** HARALD PEDERSEN. Norw. 36,173, Nov. 13, 1922. The raw material contains carbonaceous matter besides the sulfidic ore. A gas contg. O is added in limited amts. at a high temp. The gases formed by the reaction flow through the carbonaceous charge, whereby elementary S is formed according to the equation:  $SO_2 + C = S + CO_2$ . The process is preferably manipulated in shaft kilns. Pyrite as well as other sulfide ores can be used.

**Separating sulfur from other materials.** R. S. PERRY, P. W. WEBSTER and V. K. BOYNTON. U. S. 1,457,793, June 5. A mixt. of extractive liquid, spent ore and molten S such as is obtained by treating S-bearing ore with hot  $H_2SO_4$  is passed into an agitated body of liquid in a scrubber to effect sepn. of the S.

**Furnace for burning sulfur.** A. T. PRENTICE. U. S. 1,458,001, June 5. The furnace comprises a central burner having superposed hearths, a feed pipe for intro-

ducing S to the burner, a combustion chamber surrounding the central burner, a primary air flue surrounding the combustion chamber and communicating with the burner, ports connecting the combustion chamber and burner and a secondary air flue passing around a portion of the combustion chamber and communicating with it.

**Decolorizing charcoal.** YOGORO KATO. Japan. 41,284, Dec. 27, 1921. When charcoal, obtained by carbonization of wood, such as cedar, pine, fir, etc., was treated with  $O_2$  or air at red heat, the decolorizing power of the charcoal was increased, but the loss of charcoal was large. On the contrary, when the heated charcoal was treated with  $CO_2$  or steam, the decolorizing ability was also increased but the temp. lowered. In this patent, these 2 processes were combined. Charcoal packed in an Fe tube is heated to redness and a mixt. of the same amt. of  $O_2$  and steam is passed. Or the 2 gases are alternately passed into the tube. The product is especially suitable for sugar refining. It also has deodorizing power.

**Decolorizing carbon.** ALGEMEENE NORIT MAATSCHAPPIJ (known as General Norit Co., Ltd.). Brit. 189,148, Nov. 20, 1922. Decolorizing C is produced from carbonaceous material of vegetable, animal, or mineral origin, by dry distn. in the presence of activating gases or other substances with or without a preliminary distn. together with inert or slightly active gases. The gases, which may be Cl, volatile chlorides, air, steam,  $CO_2$  or CO, flue or generator gases, or mixts. of these gases, are passed through the charge in a direction opposite to that of the charge itself. The other activating substances specified are Ca or Mg carbonates and chlorides, slaked or unslaked lime or "liquids or gases." The raw materials, such as wood-waste, peat, waste cellulose, lignite, briquetted coal, etc., are charged into a retort, preferably vertical or inclined, and the active gas, preferably at  $100-600^\circ$ , is introduced at the other end. The temp. of the retort is controlled by means of the gases, heating, etc., so that it rises to a max. and then decreases. Various temps. are specified for the activation by the different gases. The retort gases produced are preferably removed at a short distance from one end of the retort to obviate the choking of the conduit by the cooled products, and may be utilized to heat the retort. The product may be ground and purified by treatment with HCl or "other chemicals."

**Titanium dioxide; vanadium compounds.** E. E. DUTT. Brit. 189,700, Feb. 10, 1922. The residues from the treatment of certain bauxites by the Bayer process are treated for the production of  $TiO_2$  and V compds. The residues, after washing, are dissolved in HCl to yield a soln. contg. about 100 g. Ti chloride per l. Any considerable excess of acid is then neutralized, the Fe is reduced, and alkali acetate added to the soln. in amt. equal to  $1/10$  of the Ti chloride present. The soln. is boiled to ppt.  $TiO_2$ , and almost completely neutralized. The filtrate is treated with Ba salts to ppt. Ba vanadate, which may be used in the prepn. of other V compds.

**Cooling liquids for radiators.** REINHARTIN-WERK CHEMISCHE FABRIK GHS. Brit. 189,741, April 28, 1922. In the liquid used in the cooling systems of motor-cars, etc., a soln. is employed of two or more metallic salts the metals of which while not differing greatly from each other in their electrochem. values, are more strongly electropositive than the most electropositive metal used in the construction of the radiator. When Mg alloys are used the soln. should contain Ca and K chlorides.

**Mixture for polishing metals.** W. A. RUDDELL. U. S. 1,457,857, June 5. A mixt. adapted for polishing Al, brass or other metals is formed from Ag cyanide 1 oz., KCN 8 oz.,  $KNO_3$  1 oz., borax about 1 oz., whiting 2 lbs.,  $H_2O$  2 qts., NaCl about 2 oz. and alc. 10-50%.

**Metal polish.** W. A. RUDDELL. U. S. 1,456,151, May 22. A mixt. for polishing Al, brass, Ni, or other metals is formed of tripoli powder 4.5 lbs., oxalic acid 8 oz., salt 1-3 oz., borax 1-3 oz.,  $H_2O$  1 gal. and alc.

**Laminated gold-containing sheet for dental use.** R. H. JEFFERIES. U. S. 1,457,370, June 5. A molding material adapted for use in forming dental articles or jewelry is prepd. by heating together layers of beeswax or other wax and Au filings upon a plate of Au to cause the particles of Au to adhere to the plate.

**Waterproofing articles of fibrous pulp.** W. H. DRAKE and J. J. DRAKE. U. S. 1,456,370, May 22. Waterproof articles such as milk bottles are formed of fibers coated with Al resinate. After the coated fibers are formed into the desired shape in a mold, air or other fluid heated sufficiently to melt the resinate is forced through the material.

**Pencils.** TUMPEI TAKEUCHI. Japan. 41,231, Dec. 22, 1921. A mixt. of 60% tar pitch, 20% petroleum pitch, and 20% asphalt is homogeneously mixed at  $200^\circ$ , cooled, and powdered. This is mixed with the same amt. of graphite and gradually heated to  $300^\circ$ . Then the product is molded to a suitable form. It is soft and easily sharpened by slight heating.

**Waterproof adhesive.** S. BUTTERMAN and C. K. COOPERRIDER. U. S. 1,456,842, May 29. A waterproof adhesive is formed from casein 2000, lime 200, Na silicate 700,  $\text{CuCl}_2$  30,  $\text{H}_2\text{O}$  300 and hydrocarbon oil 15 parts.

**Sealing composition.** J. RITTER. U. S. 1,455,809, May 22. Elastic gaskets for use in sealing covers on metal containers are formed of large proportions of glycerol and glue and small proportions of borax, paraffin, castor oil or other vegetable oil and varnish.

**Gramophones.** O. RYAN. Brit. 189,596, Oct. 10, 1921. Diaphragms for sound-boxes are made of layers of paper impregnated with  $\text{ZnCl}_2$  by the following process. Several sheets of paper are soaked in a strong soln. of the Cl, and after being superposed are pressed together by means of rollers, etc. The compressed mass is then dried by heating, is glazed, e. g., by varnishing, and is then cut to the desired size and shape.

**Thermoplastic composition containing shellac.** E. DE STUBNER. U. S. 1,456,369, May 22. A plastic material adapted for use in making *phonograph records* is prepd. by heating flock with unsatd. fatty acids such as those derived from linseed oil or other drying oils and copal or other resin of higher m. p. than shellac and then adding shellac and heating it with the other ingredients.

**Phonograph records.** P. BALKE and G. LEYSIEFFER. U. S. 1,456,047, May 22. Phonograph records are formed by coating wood, metal, cardboard or other backing material with a sound-groove receiving compn. which may be formed of nitrocellulose 35, black pigment 5, cellulose 42, and methyl- (or ethyl-) urea 18 parts. Cf. C. A. 16, 803.

**Plastic compositions.** ELEKTIZITÄTSWERK LONZA. Brit. 189,146, Nov. 18, 1922. Cuprene, a polymerization product of  $\text{C}_2\text{H}_4$ , is used as a filler in plastic compns., particularly as a substitute for cork meal, sawdust, etc., in compns. for linoleum, and like floor and wall coverings. Cuprene is obtained by polymerizing  $\text{C}_2\text{H}_4$  in presence of Cu or by means of a dark electrical discharge.

**Fishing lines.** A. H. ILLINGWORTH. Brit. 189,587, Sept. 28, 1921. A dressing for weighting fishing lines, etc., consists of an emulsion of graphite (alone or mixed with celluloid or with pigment and celluloid) with oxidizing oil and metallic Hg or Hg compds. 15-100 gr. of graphite per fl. oz. of oil may be used according to the viscosity of the oil. Cf. 13,496, 1909.

**Porous material.** NORSK AKTIESELSKAP FOR ELEKTROKEMISK INDUSTRI. Norw. 38,104 Oct. 30, 1922. Water is added, with const. stirring, in adequate amts. to fused slags in a vessel lined with fire-brick. Also the water may be sprayed out on the surface of the fusion. The sp. gr. of the porous substance obtained can be varied from 0.7 to 0.07.

**Impregnating agent for fireproofing.** M. M. IVERSEN. Norw. 33,924, Jan. 30, 1922. About 3.5 kg.  $\text{SiO}_2$  is boiled with 4.75 kg.  $\text{H}_2\text{O}$ , and 0.20 kg. dil.  $\text{HNO}_3$  is added. In this liquid 1 kg. glue is dissolved.  $\text{SiO}_2$  may be replaced by alkali silicates. Other acids may also be used.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**Progress in the glass industry.** LÉON APPERT. *Bull. soc. encour. ind. nat.* 134, 728-65(1923). E. H.

**Tests on the resistive qualities of soda-lime glasses to water.** L. A. PALMER. *J. Am. Ceram. Soc.* 6, 579-89(1923).—The amt. of alkali taken into soln. was detd. by exposing to boiling  $\text{H}_2\text{O}$  for 6 hrs., then titrating with 0.01 N  $\text{H}_2\text{SO}_4$  until complete absence of color with either phenol-red or bromothymol blue as indicator. A vol. of the dil. acid equal to twice the vol. added to destroy color was then added, the soln. was boiled 20-30 min. and then titrated back to faint color with 0.01 N NaOH. Glasses of such compn. that the ratio of  $\text{Na}_2\text{O}$  to  $\text{CaO} + \text{MgO} + \text{Al}_2\text{O}_3$  (all expressed in mol. %) was less than 1.6 were found to have excellent resistive properties.

C. H. KERR

**The manufacture and properties of oven glass.** R. F. BRENNER. *Glass Ind.* 4, 23-4; *Nat. Glass Budget* 38, No. 39, 3, 11(1923).

J. B. PATCH

**Gas producer and furnace practice in the glass industry.** RICH. SCHNEIDER. *Glashütte* 52, 625-7, 641-2, 657-8, 673-6, 689-93, 707-8, 723-4, 755-6, 771-2, 787-8 (1922).—26 figs.

J. B. PATCH

**The action of slag upon silica, magnesite, chrome, diaspore and fireclay refractories.** R. M. HOWE, S. M. PHELPS AND R. F. FERGUSON. *J. Am. Ceram. Soc.* 6, 589-95

(1923).—Powd. brick and powd. slag were mixed in varying proportions and the fusion points detd. Consideration was given to the actual fusing points of the mixts., the porosity of the brick and the depression of the fusing point due to the addn. of the slag. The slags used were: basic open-hearth, blast furnace, heating furnace, acid open-hearth and coal ash. Magnesite had a slightly higher resistance to most slags than did chrome. Silica and fireclay brick showed rather wide variations. Magnesite and chrome brick showed high resistance to basic open-hearth slag, as they do in service. Diaspore showed high resistance to all slags.

C. H. KERR

**The persistence of the color of ions in ceramic colors obtained at high temperatures.** PIERRE BREMOND. *Compt. rend.* 176, 1219-20(1923).—The coloration of different salts of the same metal, or of an acid, which in general depends upon the degree of hydration of the salt, extent of electrolytic dissociation, etc., is often apparent in ceramic colors formed at high temps. from these same salts or acids.

L. T. FAIRHALL

**The production of porcelain for electrical insulation.** F. H. RIDDLE. *J. Am. Inst. Elec. Eng.* 42, 343-6, 540-3(1923).—A history of elec. porcelain. It is defined as "an agglomerate of clay and quartz held together in a matrix of molten feldspar." Some typical analyses of the clays used are given. The phys. properties and functions of the raw materials are reviewed.

W. E. RUDER

**Comparison of the modulus of rupture of silica bricks, hot and cold.** E. C. McGRUBB. *Rev. universelle mines* 17, 36-7(1923).—The modulus of rupture (under pressure) at 1350° was approx.  $\frac{1}{3}$  that at ordinary temp. The decrease in transverse resistance to rupture was approx. inversely proportional to increase in temp. and it is possible to est. the modulus of any brick at high temps. from its value at ordinary temp. Very rapid heating to a red heat reduced the modulus disproportionately.

C. C. DAVIS

**Metallurgical requirements of refractories for furnaces melting copper alloys.** H. W. GILLET. *J. Am. Ceram. Soc.* 6, 596-609(1923).—Elec. furnaces demand better refractories than do pit furnaces. The requirements vary considerably with the type of furnace. All types require refractories that resist penetration by the metal, do not spall or crack, and have low thermal cond. and high mech. strength at working temps.

C. H. KERR

**Veralufarbe [in glass manufacture] (LECHER) 26.** Use of refractory materials in gas works (GILL) 21. Treating clay (U. S. pat. 1,456,111) 27.

**Glass.** TOSAKU YOSHIOKA. Japan. 41,227, Dec. 22, 1921. Addn. to 40,242 (C. A. 17, 1699). Superheated steam is passed into a mixt. of 100 parts of  $\text{SiO}_2$ , 22 parts of limestone, and 33 parts of NaCl, heated in a revolving furnace at about 700°. The NaCl is decompd., producing HCl gas, and the  $\text{SiO}_2$  is changed into Na salt. Then the mixt. is heated more highly and melted to glass. The mixt. is liable to become powdery and prevents the passing of steam; this difficulty is removed by mixing 2-3% CaO paste with the original mixt.

**Etching glass.** NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOBILAMPENFABRIEKEN. Brit. 189,763, Nov. 8, 1922. A process for producing transparent markings on frosted glass, such as trade marks on lamp bulbs, consists in printing or stamping the required design on the glass in an acid-resist and then etching the glass. The resist may be composed of "Lanoline," beeswax and resin with or without resin-oil and horse-fat, and is preferably applied to the glass in a fused state.

**Flux for vitreous material.** A. A. KELLY. U. S. 1,455,791, May 22. A vitreous material is prepd. with Na decaborate as a flux (as a substitute for borax to avoid triac).

**Deflocculating and reflocculating clay or other materials.** E. G. ACHESON. U. S. 1,456,112, May 22. Clay, graphite, S or other solid material susceptible to deflocculation is subjected to attrition with the product from roasted cereals and  $\text{NH}_3$  or other org. deflocculating agent and the colloidal material is afterward reflocculated by HCl, alum or other electrolyte in the presence of residual fine material to obtain a mixt. of non-deflocculated and reflocculated particles which may be used as a filler for paper, a pigment or for making crucibles.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

**The most modern portland cement plant in France.** J. PROUTEAU. *Rock Products* 25, No. 10, 11-20(1923).—A description of the plant of the Poliet and Chausson Works

at Gargenville, France. The raw materials, equipment, mfg. processes, and storage facilities are discussed in considerable detail.

**Chemistry and portland cement industry.** J. C. WIRT. *Chem. Age* (N. Y.) 31, 171-3(1923).—The portland cement industry, which includes the manuf. of cement and its use as a component of concrete, is a typical chem. industry. Three series of chem. reactions are fundamental: (1) synthesis of a number of inorg. compds. collectively known as cement (conversion of raw mix into cement clinker); (2) reactions between these compds. and water (hydration of cement after mixing with water); (3) modification of reactions in Series 2, or modification of the products of these reactions, by foreign substances (the effect of foreign substances during, or subsequent to, hydration). Control of the various processes of the industry must take into account the relative proportion of reacting substances, the velocity of reactions, and the amount and compn. of reaction products.

**Effect of integral waterproofing compounds on the strength of concrete.** D. A. ABRAMS. *Ind. Eng. Chem.* 15, 538(1923).—Comments on a paper by A. H. White (cf. C. A. 17, 864).

**Method for determining free lime in hardened portland cement.** H. PASSOW, JR. *Zement* 12, 87-9, 96-7(1923).—The method depends on the reaction of  $(\text{NH}_4)_2\text{CO}_3$  on  $\text{Ca}(\text{OH})_2$  to form  $\text{CaCO}_3$ , followed by a detn. of the total  $\text{CO}_2$ . Grind 2 g. of the hardened cement to a fine powder and thoroughly mix with an equal wt. of c. p.  $(\text{NH}_4)_2\text{CO}_3$ . Heat to  $300^\circ$  for 10 min. Repeat the mixing and heating with  $(\text{NH}_4)_2\text{CO}_3$  3 times. Det.  $\text{CO}_2$  in the mixt. by the Lunge and Marchlewsky method. Any  $\text{H}_2\text{S}$  is removed from the gas by passing through a  $\text{HgCl}_2$  soln. The  $\text{CO}_2$  is calcd. to free  $\text{CaO}$ . The method was applied as follows: Five samples of portland cement were mixed with water and allowed to set. The  $\text{CaO}$  was detd. every 24 hrs. for the first 7 days and then once a week for 3 months. The  $\text{CaO}$  formed reached a max. of 9-12% in 48 hrs. and then decreased and remained const. at about 8%. The formation of free  $\text{CaO}$  is a necessary factor during the hardening of cement. Detn. of the free lime, together with the analysis, and strength tests, indicates whether a concrete will resist the action of sea water. A concrete with a fairly high proportion of free lime and a high strength withstands the action of sea water.

**Free lime and the resistivity of concrete to sea water.** C. PRÜSSING. *Zement* 12, 113(1923).—A criticism of the work of H. Passow (cf. preceding abstr.). Some cements with no free lime withstand the action of sea water.

**The fine grinding of cement raw mix.** F. TIPPMANN. *Zement* 12, 72-3(1923).—T. prepared mixts. of a calcareous marl and limestone, and a clay marl and limestone. These were passed through 900-mesh, 4900-mesh and 10,000-mesh sieves (openings per sq. cm.). The residues from each sieve were heated. Residues from the 900-mesh did not sinter; those from the 4900-mesh were partly sintered; and those from the 10,000-mesh were fairly well sintered. Sintering was less complete in mixts. which were passed through the sieves with water.

**The mixing proportions of trass and lime.** A. CANTZLER AND A. SPLITZGERBER. *Zement* 12, 57-8, 63-4(1923).—The work agrees with that of Burchartz (cf. C. A. 17, 1874). A complete bibliography on trass mortars is given.

**The degree of fineness of cement raw mix.** GOSLICH. *Zement* 12, 66-7(1923).—A theoretical discussion of how  $\text{Al}_2\text{O}_3$  combines with  $\text{CaCO}_3$  during the formation of the clinker. G. considers a mixt. of 75%  $\text{CaCO}_3$  and 25%  $\text{Al}_2\text{O}_3$ .

**Progress of cement research, 1919-1922.** C. R. PLATZMANN. *Zement* 12, 73-6, 79-82(1923).—A review with a bibliography.

**The influence of atmospheric moisture on the contraction of cement.** H. NITZSCHE. *Zement* 12, 42-4(1923).—Two test pieces were made from each of several cements. One was allowed to dry exposed to atm. moisture and the other dried in a desiccator. The pieces were measured from time to time to det. contraction. The contraction of the specimen in the desiccator was more regular and was greater at the end of 24 days than those dried in air.

**Barium carbonate as a protection for concrete against sulfate solutions.** H. NITZSCHE. *Zement* 12, 51(1923); cf. C. A. 16, 998.— $\text{BaCO}_3$  was added in varying quantities (1-15%) to concrete test specimens. The specimens were placed in a  $\text{MgSO}_4$  soln. which was replaced every 3 months. The specimens were allowed to remain for 38 months. Specimens without  $\text{BaCO}_3$  were attacked by the sulfate soln.  $\text{BaCO}_3$  (in proportion to the amt. present) retarded the action of the  $\text{MgSO}_4$  the specimens contg. 15%  $\text{BaCO}_3$  showing only slight action.

**Stored cements.** C. PRÜSSING. *Zement* 12, 82-4(1923).—Three com. cements were spread out on paper and allowed to remain for 6 to 7 weeks. The humidity was

kept const. The strength decreased as compared with that of the fresh cement. Seven German cements were stored in tin containers for 6 to 9 yrs. The strength showed a slight decrease in most cases. One cement was stored in a sack and the strength decreased markedly at the end of 2 yrs.

R. F. SCHNEIDER

**The action of calcium sulfide in hydraulic cements.** TH. SCHAUER. *Zement* 12, 11-2(1923).—CaS present in a cement reacts with  $\text{CO}_2$  and  $\text{O}_2$  from the air. It also reacts with silicic acid and  $\text{FeSiO}_3$  to form  $\text{CaSiO}_3$  and  $\text{H}_2\text{S}$  or  $\text{FeS}$ . These reactions take place especially where slag is used in making cement owing to high S content. This is shown by (1) the  $\text{H}_2\text{S}$  evolved on breaking a compression cylinder of slag and gypsum, and (2) the formation of greenish black  $\text{FeS}$  on the broken pieces. The compressive strength of a mixt. of gypsum and slag increases as the test specimens are aged owing to formation of Ca silicate by the reaction of  $\text{CaSO}_4$  and  $\text{FeSiO}_3$ . H. W. FREDE. *Ibid* 35-6.—A criticism. The CaS reacts with water and forms some OH ions. These OH ions are necessary for hydraulic cements to harden as shown by mixts. of trass and  $\text{CaSO}_4$ . A mixt. of trass and 10%  $\text{CaSO}_4$  will not harden in water. If 20% CaS was added, the mixt. will harden.

R. F. SCHNEIDER

**The use of calcium chloride as a protecting agent against freezing of concrete.** P. COTTRINGER AND H. S. KENDALL. *Concrete* 22, 150-5(1923).—The advantages and limitations of the application of artificial heat and the use of  $\text{CaCl}_2$  as methods of protecting concrete from freezing are discussed. The first is the safest method provided the temps. are well controlled and provided, also, that the cost is not prohibitive.  $\text{CaCl}_2$  when used in proper amts. is beneficial. There is a gradual increase in strength with amts. up to 6%, which amt. gives the max. strength not for early periods but at ages over 7 days.  $\text{CaCl}_2$  will not keep concrete from freezing at any temperature lower than the freezing point of a solution with which the concrete is gaged (with 6%  $\text{CaCl}_2$ ,  $2\text{H}_2\text{O}$  and with a consistency of 1.10, the water solution will freeze at about  $25^\circ\text{F}$ ). The behavior varies somewhat with different brands of cement. From a preliminary work it can be said that no additional corrosion of reinforced steel will be found when  $\text{CaCl}_2$  is used, particularly in the absence of stray elec. currents.

J. C. WYTT

**Effect of sugar in concrete mix.** M. LORA. *Concrete* 22, 160(1923).—The failure of a portion of the concrete in a building belonging to the Cuba Northern Railroad at Moron was traced to the presence of about 2% of sugar in the sand used. The sand was shipped to the job in a freight car which had previously carried sugar.

J. C. WYTT

**Effect of sugar on cement mortar.** J. DAUTREBANDE. *Concrete* 22, 161(1923).—Several structures in which a part of the concrete failed to harden were examd. and the difficulty was traced to the presence of small amts. of sugar. The presence of 0.01% sugar in a 1:3 mortar caused a reduction of 10% in the 7-day strength.

J. C. WYTT

**Action of sugar juices on concrete.** E. J. OCHS. *Concrete* 22, 161-2(1923).—A number of 1:3 mortar specimens, which were treated with 10% sodium silicate soln., were placed in contact with sugar juices. The results obtained indicate that well made, dense, and impermeable concrete will not disintegrate through the action of sugar.

J. C. WYTT

**Concrete in the construction of chemical manufacturing facilities.** A. C. IRWIN AND F. W. ASBORN. *Ind. Eng. Chem.* 15, 562-5(1923).—A general discussion of the use of concrete for buildings, floors, tanks, etc.

R. F. SCHNEIDER

**Calcium aluminium silicate and the zeolite question.** ST. REINER. *Zement* 12, 49-51, 55-7, 65-6(1923).—A review and criticism of previous work on zeolites.

R. F. SCHNEIDER

**Preservation of wood.** R. CHAVASTELON. *Compt. rend.* 176, 1178-9(1923).—Copper dichromate is the most satisfactory soln. for treatment of timbers exposed to damp atm., such as occur in wine cellars. The soln. is made by mixing cold 6% solns. of K or Na dichromate with  $\text{CuSO}_4$  in wooden containers. The  $\text{CuCr}_2\text{O}_7$  soln., after destruction of the organisms causing decay by oxidation, is rapidly transformed into a basic Cu chromate, which being slightly sol. is pptd. in the pores of the wood, thus maintaining a reserve which dissociates progressively into chromates increasingly basic.

L. W. RIGGS

**Recent practice in wood impregnation.** F. MOLL. *Chem. App.* 10, 61-3, 70-3(1923).—A general discussion, with 8 cuts, of methods and app., including Kyan's method of soaking for 8 days in a soln. of 0.4%  $\text{HgCl}_2$  and 1.26%  $\text{NaF}$ .

J. H. MOORE

Marine borer paints (GARDNER) 26.

Acidproof mortar. P. G. EKSTRÖM. U. S. 1,456,303, May 22. A mortar which

is resistant to acids is formed from finely divided hard siliceous material such as blast furnace slag 55-78, PbO 12-30, a Mg silicate material such as soapstone 10-15 parts and water glass.

**"Plastic gypsum."** R. E. HAIRE. U. S. 1,457,161, May 29. "Plastic gypsum" is prepd. by passing calcined gypsum through a tube mill without permitting substantial circulation of air through the mill, to prevent loss of  $H_2O$  during the grinding, and allowing the material to discharge from the periphery of the mill when it has attained the desired degree of plasticity.

**"Nailing" concrete for making slabs.** J. E. KLEIST. U. S. 1,456,985, May 29. Slabs which may be nailed in building construction are formed of cement 188, sand 360, asbestos 75 and pulverized slate 25 lbs. \*

**Highway surfacing composition.** D. M. HEPBURN. U. S. 1,456,492, May 22. Coarse granular  $CaO$  is mixed with heated  $H_2O$  to form a thin mortar, earthy material is added and when any acids present have had time to become neutralized the still heated and relatively dry compn. is mixed with pitchy material for immediate use for road surfacing.

**Plaster from lime sludge.** P. E. HAYNES and G. P. GERFIN. U. S. 1,456,924, May 29. Lime sludge such as is obtained in producing  $C_2H_2$  from carbide is mixed with ground coal ashes or slag or other  $H_2O$ -absorbing cementitious material in such proportions as to form a product of plaster-like consistency adapted for use as a plaster-board material. Asbestos and Na silicate may be added.

**Plaster.** G. T. OLIVER. Brit. 189,276, Sept. 19, 1921. A plaster for walls, ceilings, moldings, etc., consists of magnesite 1,  $MgCl_2$  crystals 1, and pulverized waste by-products such as destructor residue, loam, chalk, or sand 10-20 pts. 20% of calcined shells may be added to the by-products.

**Testing bituminous paving mixtures.** F. S. BESSON. U. S. 1,457,015, May 29. A block or specimen from a paving material of known service or durability and compn. is subjected to blows of a falling body as is also a test sample of paving material which is to be compared with the sample of known quality and the relative no. of blows required to disintegrate the samples or cause the falling body to become imbedded in them are noted for the purpose of comparison.

**Artificial stone.** H. BERRY. U. S. 1,456,667, May 29. A mixt. adapted for flooring or similar purposes is formed of powd. slate 85, calcined magnesite 10 and  $NaHCO_3$  5 parts together with a trace of  $BaCl_2$  or other sol. Ba compd. which serves to hasten hardening. Asbestos or the like may be added to form a heat insulation.

**Insulating stone.** ALF. SINDINGH-LARSEN. Norw. 34,272, May 6, 1920. Improvement of Norw. pat. 33,113. The materials contg. gas- or vapor-generating substances are fused under atm. pressure and brought to cool and solidify under reduced pressure.

**Treating wood.** M. SPARKES. Brit. 189,268, Sept. 8, 1921. The surface is treated with a soln. of gallic acid, pyrogalllic acid, tannic acid,  $CuSO_4$ , or  $FeSO_4$ ; it is then dried and treated with  $NH_3$ , either gaseous or in soln.

**Impregnating wood with cement.** F. H. MCPHERSON and J. M. ABRAMS. U. S. 1,456,323, May 22. Wood (e. g., posts) is heated and air and moisture are exhausted from its pores. It is then treated with a liquid cement mixt. and after removal of excess mixt. is maintained under pressure until the cement has at least partially set in the wood.

**Drying wood.** G. F. LYON. U. S. 1,456,809, May 29. Wood to be dried is subjected to a pressure somewhat reduced below atm. pressure and is then treated with ozonized air.

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

**Determination of hydrogen sulfide.** C. H. STONE and E. O. WHIG. *Gas Age-Record* 51, 649-50, 655(1923).—Other processes are reviewed and a satisfactory method for continuous detn. of  $H_2S$  in gas is described. It is a revision of the method given in *Gas Chemists' Handbook*, 2nd. ed. The method is accurate, easy of manipulation, not expensive for either chemicals or labor, and capable of being checked with precision.  $CN$  is also detd. by it. The gas is passed at a rate of 0.5 to 1.0 cu. ft. per hr. through an absorption train consisting of a tar camera, 1 empty bottle, 5 bottles each contg. 100 cc. of approx. 2 N  $NaOH$  soln., and 1 bottle contg.  $Pb(C_2H_3O_2)_2$  paper. A wet meter follows the train. The temp. of the gas, and the barometric and gas

pressures are recorded every hr. After satn. is complete, the absorption soln. is made up to 1 l. and 25 cc. is transferred to a suction flask, and 25–50 cc.  $H_2O$  and a few drops of *p*-nitrophenol indicator are added. Then a known amt. of 0.1 *N* I soln. is run into the I separatory funnel, and a quantity of 2 *N* HCl added to a second and a few cc. of starch soln. put into the suction flask. With the I separatory funnel in place, suction is applied to the side arm of the flask, which is then closed off by a pinchcock leaving the flask under partial vacuum. Then the separatory funnel contg. the acid is attached to the side arm of the flask and by opening the pinchcock acid is run in until the soln. is slightly acid. The acid funnel is then removed, while the pinchcock is kept closed. I is run into the flask together with the washings of the funnel. The excess I is titrated with 0.1 *N*  $Na_2S_2O_3$  soln. and I is added to the blue end point. From the no. of cc. of 0.1 *N* I used in the titration and the vol. of gas passed, corrected for temp. and pressure, the  $H_2S$  is calcd. as grains per cu. ft.

J. L. WILEY

**Recent developments in gas producers.** T. R. WOLLASTON AND A. L. BOOTH. *J. Soc. Chem. Ind.* 42, 200–3T(1923); *Iron Coal Trades Rev.* 106, 751; cf. C. A. 17, 1880.—Under favorable conditions a yield of at least 80 lb. of  $(NH_4)_2SO_4$  per ton of coal is expected from the producer and 10 lb. from the retort. The av. gas yield is about 125,000 cu. ft. from inferior coal. The gas is remarkably free from dust.

J. L. WILEY

**Distillation of ammoniacal liquor.** W. MASON. *Gas J.* 162, 219(1923).—With the type of app. generally used in gas plants for the distn. of the  $NH_3$  liquors, the loss of  $NH_3$  is frequently as high as 30%, an offensive condensate contg.  $H_2S$  is produced, and many difficulties are experienced in the working of the  $Fe_2O_3$  purifier. A much more efficient arrangement is made by placing a coil condenser between the still and the saturator, as is done in the  $NH_3$ -soda process for dehydrating the  $NH_3$  gas from the still. By this method, the loss of  $NH_3$  is kept at a minimum, the condensed liquor is returned to the still, and the  $H_2S$  recovered instead of being allowed to escape and become a nuisance.

J. L. WILEY

**Recent developments in connection with gas-fired steam-boilers and the utilization of waste heat for steam-raising purposes.** W. GREGSON. *Gas J.* 162, 351–5(1923); *Gas World* 78, 388–90.—A description and discussion of the Spencer-Bonecourt "Kirke" gas-fired boiler and waste-heat boiler.

J. L. WILEY

**The influences of oven construction on the composition of tar and gas benzene.** FRANZ FISCHER. *Brennstoff-Chem.* 4, 49–51(1923).—The benzenes are to a great extent distd. from anthracite coal when a temp. of 300–350° has been reached. Distillates which become heated to a temp. of 600° or higher are changed to a great extent owing to decompn. of compds. of high mol. wt. A type of rotating oven now used is so constructed that coal is continuously fed in at one end and gradually heated to 600° as it passes through the length of the oven. The semi-coke is discharged at the opposite end. The volatile products of the distn. pass out through a second opening at the discharge end of the oven. Criticism is made of this oven design as the volatile products are subjected to too high a temp. This difficulty could be avoided by having the discharge pipe for the volatile products at the same end as the opening for the coal.

C. T. WHITE

**The examination of low-temperature coal tars.** I. J. J. MORGAN AND R. P. SOULE. *Ind. Eng. Chem.* 15, 587–91(1923).—The compn. of tars produced in the low-temp. carbonization of coal presents a problem of analysis with which no standard methods are designed to deal. This paper and a subsequent one give a critical review of methods which were tested in obtaining the results given in a previous publication (cf. C. A. 16, 2591). In examg. tar acids large amts. of higher homologs must be removed by repeated distn. before phenol and the cresols can be detd. For detn. of these, methods based on f. p. and sp. gr. of mixts., together with Raschig's nitration method, are satisfactory. The hydrocarbons may be sepd. into two groups, one contg. paraffins and naphthenes, the other aromatics and unsatd., by means of 98%  $H_2SO_4$ . The selective solvents,  $Me_2SO$ ,  $SO_2$  and  $SeOCl_2$ , as well as oleum and nitrating mixts. gave low results. For detg. relative amts. of paraffins and naphthenes physical methods based upon refractive index and sp. gr. are preferred.

J. J. MORGAN

**Acid resin pitch.** R. KATTWINKEL. *Brennstoff-Chem.* 4, 55–6(1923).—The resin obtained from the  $H_2SO_4$  waste of a  $C_6H_6$  works consists of a mixt. of aromatic S combinations. This acid resin has no properties of a pitch. Freed from acid and dried at 100°, the resin has a dark violet color and can be easily pulverized. The following consts. have been detd. for this material;  $d_{25}$  0.543; I No. (Hubl), 22.8; compn., C 83.40, H 6.20, S 7.53, N 0.62, O 2.21, ash 0.04%; calorific value, 8332 Cal. Extn. of this resin with aniline gave a pitch with  $d_{25}$  1.117, I no. 20.1. On heating the pitch with a 25% NaOH soln. aniline is split off. K. concludes from this that the S combinations



of the acid resin are in the form of sulfo acid esters, which are neutral and satd., as the pitch and resin have approx. the same I number.

C. T. WHITT

**Separation of simple constituents of low-temperature tar by means of picric acid.** H. SCHRADER AND C. ZERBE. *Brennstoff-Chem.* 3, 372-4(1922).—After the usual purification with NaOH and H<sub>2</sub>SO<sub>4</sub>, followed by distn., the oil was treated with 10% of its wt. of picric acid and warmed on a water bath. On cooling in an ice-chest crystals sepd. out. The oil residue was again treated with 10% of its wt. of picric acid, and this process repeated 5 times. The crystals were washed with an alc. soln. of picric acid, 580 g. of oil gave altogether 232.8 g. of crystals. These were treated with NaOH, yielding 40 g. of hydrocarbons (6.9% of the original oil) on extrn. with ether. 24.8 g. of this passed over on steam distn. Fractionation of this gave several distinct fractions, but the quantities were too small for satisfactory examn. The presence of a small quantity of naphthalene was proved, and that of methylantracene indicated.

J. S. C. I.

**Factors which determine the quality of the coke obtained in the laboratory by the modified Bochum method.** D. J. W. KREULEN. *Chem. Weekblad* 20, 304-7(1923).—The coke obtained from dry coal according to the directions given by K. (C. A. 17, 2179) is smoother than that obtained from moist coal. A coal contg. a certain percentage of moisture and giving a coherent coke may furnish only a powdered coke if heated in dry state. In order to judge the cohering power of a coal it should be heated after drying.

R. BEUTNER

**Clairine.** E. HADDON. *Rev. agr. Maurice* 1, 35-6(1923).—This is a motor fuel manufd. in Mauritius and composed of 79.208% by vol. of 96% alc., 0.396% pyridine, 0.396% Simonsen oil, and 20% ether; it is colored with methyl violet. To det. the ether in Clairine, pour 10 cc. of it into a tube graduated in tenths of cc., add 45 cc. of a NaCl soln. of 24° Baumé, shake and let stand. The vol. of supernatant ether times 10 equals % in fuel. Pyridine is detected by adding to 10 cc. of the alc. 5-6 drops of a 2.5% soln. of phosphomolybdic acid; a yellowish ppt. is obtained, which dissolves on heating and reappears on cooling.

F. W. ZERBAN

**Motor truck running on lean gas.** ANON. *Recherches et inventions* 4, 393-400 (1923).—A detailed description of the construction and operation of a motor-truck running on lean gas from a gas producer burning wood waste (sawdust, shavings, etc.) and charcoal, mounted on the truck itself. (Cf. Auclair, C. A. 16, 2214.) A. F.-C.

**Fuel oil.** JULES DAUTREBANDE. *Rev. chim. ind.* 38, 85-8(1923).—Brief description of the qualities required of fuel oil.

A. PAPINEAU-COUTURE

**Calorific value.** W. B. DAVIDSON. *Gas J.* 162, 345-8; *Gas World* 78, 413-6 (1923).—D. strongly advocates the use in the valuation of gas coals of the calorific value test in addn. to the ordinary tests for proximate analysis, since of 2 coals the one having the higher calorific value will be the better for gas manuf. For such detns. the Mahler-Cook bomb is preferred, and detailed and specific directions are given for its use and for the calcs. to be made. He questions the legitimacy also, in testing of calorific value of gas for making charges on the therm system, of correcting to 60° F. and 30 in. pressure, since in view of the fact that the mean temp. of the gas at the consumer's meter is about 45-48° F. and as moist gas increases in vol. approx 1% for a rise of 4° F., the gas maker is being deprived of about 3%. A new gas calorimeter is described which is simple in construction, low in cost, and has a practically theoretical gross efficiency of 99.9%. It is of the usual cylindrical vertical type and consists essentially of a gas burner, a small scrubbing tower, and a water distributor. The packing of the scrubber consists of thin Cu strips in spiral form so as to expose as large a wetted surface to the hot gases as possible without offering much resistance to the passage of the gas. The water distributor consists of a circular movable plate carrying taper pins which pass through small holes in another flat circular plate. These taper pins or needle valves are capable of being raised or lowered by a screw, and the effect is to allow water in the top chamber to fall on to the packing by drops from about 150 points. It may be fitted with thermometers indicating or recording gross value.

J. L. WILEY

**Calorific value of gas as actually supplied.** W. B. DAVIDSON. *Gas J.* 162, 479-81 (1923).—A further discussion of the point made in the preceding abstract that in selling gas on the therm basis tests of calorific value should be made under conditions approximating those of the av. consumer's meter in regard to temp., pressure, moisture, and altitude, without applying any corrections for temp. and pressure.

J. L. WILEY

**Practical examination of coal.** F. C. WIRTZ. *Chem. Weekblad* 20, 273-9(1923).—The exact conditions of taking samples, the analytical methods for detg. moisture and ash and the calorimetric methods are discussed.

R. BEUTNER

**The determination of the volatile matter in anthracite coal.** J. H. STEIN. *Brenn-*

*staff-Chem.* 4, 52-4(1923).—A comparison is made between the Muck method, the Bochum method, and the American method. In Muck's method 1 g. of coal is placed in a Pt crucible 3 cm. in depth having a well fitting cover, and heated with a Bunsen flame of such a height that the crucible is entirely surrounded by the flame. The bottom of the crucible is 3 cm. above the top of the burner. When the flame no longer appears around the edges of the cover of the crucible the burner is removed and the loss in wt. detd. In the Bochum method 1 g. of coal is placed in a Pt crucible 40 mm. X 20 mm. fitted with a cover having an opening 2 mm. in diam. The crucible is heated in a Bunsen flame 18 cm. in height. The bottom of the crucible is 7 cm. above the top of the burner. The detn. is continued until the flame no longer burns through the opening in the cover. In the American method described, a Pt crucible with cover weighing 20-30 g. is used. The bottom of the crucible is 6-8 cm. above the burner, the flame of which is 20 cm. in height. The time of heating is 7 min. Comparative results of the three methods are given; both a Bunsen and a No. 3 Meker burner were used. The American method gives results 0.5-1.4% higher than the other two methods described when a Bunsen burner is used. With a Meker burner the results are in closer agreement, the American method giving values 0.1-0.7% higher. C. T. WHITE

Plastic state of coal. G. E. FOXWELL. *Gas World* 78, No. 2024, (Coking Sec.) 12-5(1923); *Iron Coal Trades Rev.* 106, 706-7; *Gas J.* 162, 355-6.—Yorkshire coal when heated at the rate of 1° per min. commences to become plastic at 370°. This continues to 480°. During the plastic state the  $\gamma$  compds., which are the only ones that fuse, are at a max. at about 400° to 430° and then decrease slowly until, when about 5% is present, plasticity ceases. No definite and final explanation can yet be given as to what causes the plastic state, but it seems that it is dependent upon the structural arrangement of the  $\alpha$ ,  $\beta$  and  $\gamma$  compds. in the lumps of coal. In connection with the generally accepted theory of the formation of coke, the factor of surface tension seems to have been neglected. It is this force which causes the fluid particles of coal to take up a globular shape and to maintain this shape. The first stage of coking is therefore the formation of these globules either by extrusion or fusion; later they cohere under the influence of gas evolution from the well known cell structure of coke. J. L. WILBY

Technical distillation analysis of coal. M. FREUND. *Brennstoff-Chem.* 3, 374-5 (1922).—Fifty g. of well pulverized coal is placed in a glass retort of 250-300 cc. capacity, and the retort is slowly heated to redness and maintained for 6-8 hrs. at that temp. by means of a flame. The first receiver is graduated and cooled with water. Water and tar collected in this are weighed and the receiver is warmed to 80°, when the tar comes to the surface. 5-20 cc. of benzene is then added. The vol. of water is measured. The sp. gr. of the aq. liquor should be detd. and the wt. of tar in the upper layer can then be calcd. J. S. C. I.

Chemical breakdown of coal by pressure oxidation. F. FISCHER, H. SCHRADER AND W. TREIBS. *Ges. Abhandl. Kennt. Kohle* 5, 267-91(1920).—1 kg. of coal (Mausegatt) with C 90.3, H 3.7, H<sub>2</sub>O 1.0, and ash 1.8% was suspended in 2.5 N soda soln. and treated with a current of air for 1 hr. (400 l. per hr.) at 60 atm. pressure and at 250°. 202 g. remained undissolved and 4.86 equivs. of acids were formed, including benzoic, phthalic, isophthalic, trimelic, benzenepentacarboxylic, and mellitic acids, and phthalic anhydride. When the treatment lasted 68 hrs. the decompn. was extensive and 1.5 equivs. of acids were obtained, again mostly aromatic. In the soln. from an extensively oxidized gas coal (Lohberg) benzoic and terephthalic acids were found. Apart from the lower fatty acids the acids obtained were always benzene derivs., pointing to an aromatic structure in the coal. J. S. C. I.

The first experiments on the pressure oxidation of coal and lignite. F. FISCHER AND W. SCHNEIDER. *Ges. Abhandl. Kennt. Kohle* 5, 186-92(1920).—Alkali-sol. Niedersauitz brown coal, lignite from the Riebeck Montanwerke, and a bituminous coal from Osterfeld were treated. The last proved most resistant. A variety of acid products was obtained in addn. to the residue insol. in alkali. J. S. C. I.

Production of oil from lignite by pressure oxidation at 400° in aqueous alkalies. F. FISCHER AND H. SCHRADER. *Ges. Abhandl. Kennt. Kohle* 5, 366-8(1920).—In each expt. 4 g. of powd. Union briquets was heated with alkali (hydroxides of Na, Ca, or Ba, or Na carbonate) equiv. to 8 g. of Na formate. All gave viscous or semi-solid brown oily products. When the hydroxides of Na and Ba were used the yield reached 25.6% and 26.2%, resp., and in the former case formate was identified in the product. Otherwise the yield of oil was only small. J. S. C. I.

Chemical breakdown of lignite by pressure heating. F. FISCHER AND H. SCHRADER. *Ges. Abhandl. Kennt. Kohle* 5, 360-5(1920).—During the pressure oxidation of Rhine-land lignite in 0.1 N KOH, oxidation and sapon. reactions occur and possibly hydro-

genation also. About 25% was unattacked, but this contained matter insol. in alc. and sol. in pyridine (bitumen?). In the alkali soln. were salts of a variety of acids, volatile fatty acids, non-volatile acids, humic acids, and catechol and pyrocatechuic acid. The total yield of products obtained was 68%, of which  $\text{CO}_2$  formed 18%.

J. S. C. I.

**Chemical breakdown of lignite by pressure oxidation.** F. FISCHER, H. SCHRADER, AND W. TREIBS. *Ges. Abhandl. Kennnt. Kohle* 5, 235-66(1921).—Union (lignite) briquet material (C 62.5%, H 4.7%) was treated with 400 l. of air per hr. for 12-14 hrs. at 200°. 100 g. of ash- and moisture-free coal yielded 0.8 equiv. of acids, both volatile fatty acids and non-volatile aromatic acids. The same quantity, after heating for 25 hrs. at 200° in 2.5 N soda soln., yielded 0.13 equiv. of acids. The solns. oxidized at 250° under pressure, gave isophthalic, terephthalic, trimelic, and trimellitic acids, pointing to an aromatic structure in the humus substance.

J. S. C. I.

**Pressure oxidation of lignites in the presence of lime, baryta, magnesia and zinc oxide.** F. FISCHER, H. SCHRADER AND W. TREIBS. *Ges. Abhandl. Kennnt. Kohle* 5, 292-306(1920).—400 g. of Saxon lignite (8%  $\text{H}_2\text{O}$ ) in 1600 g. of water and 150 g. of  $\text{Ca}(\text{OH})_2$  was subjected to pressure oxidation for 26 hrs., the water being changed every 2 hrs. In the products were 149.4 g. of Ca salts sol. in water, 12.9 g. sol. in  $\text{AcOH}$ , and 6.8 g. insol. in  $\text{AcOH}$ ; C as  $\text{CO}_2$  and  $\text{CaCO}_3$ , 87.6 g.; and residue insol. in  $\text{HCl}$  168.2 g. When the expt. was repeated without changing the water, only 81 g. of Ca salts was obtained and 219.5 g. of insol. residue. 400 g. of Rhenish lignite (16%  $\text{H}_2\text{O}$ ) oxidized for 3 hrs. under the same conditions (50 atm. pressure with 200 l. of air per hr.) lost 115 g. The products contained 20 g. of Ca salts and 27 g. of acids—mainly insol. in water. The other oxides named were also tried as catalysts. In presence of  $\text{BaO}$  the yield of decompn. products was greater than in presence of  $\text{CaO}$  and  $\text{MgO}$ .

J. S. C. I.

**Pressure heating of alkaline solutions obtained in the pressure oxidation of coals.** F. FISCHER, H. SCHRADER AND W. TREIBS. *Ges. Abhandl. Kennnt. Kohle* 5, 319-31 (1921); cf. above.—The soda soln. obtained in the pressure oxidation of Union briquets was heated for 3 hrs. in an autoclave at 400°. In addn. to gases, there were obtained 0.58% of neutral oils, 4.49% of neutral and 2.55% of acid products of high mol. wt., and volatile acids, including benzoic, isophthalic, terephthalic, and mellitic acids (0.33 equiv.). Similar results were obtained by heating solns. from the pressure oxidation of a semi-bituminous coal. Similar treatment of a soln. obtained by pressure oxidation at 250° gave a product contg. in addn. to neutral oils, aromatic acids. Dry distn. of the Na salts yielded appreciable quantities of benzoic and isophthalic acids.

J. S. C. I.

**Influence of experimental conditions on the pressure oxidation of lignite.** F. FISCHER AND W. SCHNEIDER. *Ges. Abhandl. Kennnt. Kohle* 5, 160-85(1920).—The influence of time, temp., and presence of iron on the pressure oxidation of Union (lignite) briquets was studied. The  $\text{CO}_2$  content of the gas, initially 8-10%, fell rapidly to 2-3%, and then further to 1-2%, apparently corresponding to the disappearance of humic acids sol. in water and alc. After prolonged oxidation the alkali-sol. portion of the coal was destroyed almost entirely, then the acids insol. in water and alc., and later, gradually, the portion sol. in alc., leaving finally water-sol. products only; possibly a part of these is broken down also. The results of longer oxidation at a lower temp. were substantially the same. The use of iron as catalyst showed no advantage. After oxidation for 6 hrs. the products calcd. to the original carbon were—as gas ( $\text{CO}_2$ ) 47%, unattacked 2%, acids insol. in water 14%, water-sol. products 21%, loss 13%.

J. S. C. I.

**Composition of the viscous lignite tar oils.** J. MARCUSSEON AND F. BÖTTGER. *Brennstoff-Chem.* 3, 369-70(1922).—Two machine oils from lignite tar were examd., one a distillate from low-temp. tar, the other a  $\text{ZnCl}_2$  condensation product from light oil from ordinary lignite tar. The oils are shown to differ considerably from similar oils from petroleum in chem. compn. Characteristic of lignite tar oils is the presence of ketones, as shown by the difference in the acetyl value before and after hydrogenation.

J. S. C. I.

**Pressure heating of Rhineland lignite (Union briquets) in soda solution.** W. SCHNEIDER. *Ges. Abhandl. Kennnt. Kohle* 5, 369-71(1920).—The heating was effected in 2.5 N soda soln. and at 150, 170 and 250°. The attack was much slower than in the presence of  $\text{NaOH}$ . The difference may be due to the decompn. of anhydrides, lactones, or esters, and these processes may account for some part of the humic acid products obtained which are not necessarily the result of oxidation.

J. S. C. I.

**Chemical breakdown of coal, lignite, lignin and cellulose.** F. FISCHER AND H.

SCHRADER. *Ges. Abhandl. Kennt. Kohle* 5, 200-10(1921); cf. *C. A.* 15, 2706.—Cellulose, lignin, humic substances from sucrose, Union (lignite) briquets, and a semi-bituminous coal were subjected to pressure oxidation. Pressure oxidation for 3 hrs. at 200° and 45-50 atm. decomposed 10% of the older coals, 30% of the younger, up to 90% of the peat and lignite, 75% of the wood, and all the cellulose. The products were CO<sub>2</sub>, and a variety of acids, among which formic, acetic, oxalic, succinic, fumaric, benzoic, phthalic, isophthalic, terephthalic, trimellitic, pyromellitic, trimesic, benzenepentacarboxylic, and mellitic acids were identified. These, it is concluded, point to essentially aromatic structure in the coal.

J. S. C. I.

**Oxidation of peat with air at 100°.** F. FISCHER AND A. SCHELLENBERG. *Ges. Abhandl. Kennt. Kohle* 5, 132-4(1920).—The peat worked into a cream with water was kept at 100° while a current of air was passed through. The action was very slow, and after 154 hrs. the CO<sub>2</sub> in the exit gases accounted for only 4% of the C originally present. Only traces of acid products were detected.

J. S. C. I.

**Comparative experiments on pressure oxidation of peat, humus coals and sapropelites.** F. FISCHER AND W. SCHNEIDER. *Ges. Abhandl. Kennt. Kohle* 5, 135-59 (1920).—The specimens examd. included 3 samples of Velen peat, one brown coal, Rhineland, Niederlausitz and Bohemian coal, lignite, pressure-extd. Union briquet, and lignite, cannel, and Wurttemberg and Messel oil shale. A quantity of the sample corresponding to 350 g. of the dried material was mixed with 212 g. of calcined soda and so much water that together with the moisture of the sample 1600 cc. of 2.5 N soln. was obtained. The mixt. was oxidized for 7 hrs. at 700° by air at 43-45 atm. pressure led through at the rate of 400 l. per hour. The cannel was most resistant, leaving 60% unattacked. Excepting this and the oil shale, all samples contained groups which were readily attacked with the formation of CO<sub>2</sub>, leaving more resistant residues. The exit gas at first contained 8-10% CO<sub>2</sub>, but this fell fairly rapidly to 3% and still lower later but more slowly. All humus coals and sapropelites yielded acid products and humic and resinous products. Peat was most easily oxidized and left the smallest residue unattacked.

J. S. C. I.

**Pressure heating of peat in milk of lime.** W. SCHNEIDER AND A. SCHELLENBERG. *Ges. Abhandl. Kennt. Kohle* 5, 407-12(1920).—When a mixt. of peat and milk of lime was heated for 2 hrs. at 180° about 20% of the dry peat was obtained as Ca salts sol. in water. The yield after heating for 4 hrs. was not increased, but was greater with the younger peats. The effect of heat on the Na salts of the products at 400° was to produce oils amounting to 10%, together with CO<sub>2</sub> and combustible gas.

J. S. C. I.

**Pressure heating of peat with water.** W. SCHNEIDER AND A. SCHELLENBERG. *Ges. Abhandl. Kennt. Kohle* 5, 372-6(1920).—On heating Velen peat with water under pressure the peat residue and ext. accounted for 75% of the substance taken, leaving 25% for water and water-sol. products (formic and acetic acids, aldehyde, etc.) and gas.

J. S. C. I.

**Action of aqueous alkalis on peat.** W. SCHNEIDER AND A. SCHELLENBERG. *Ges. Abhandl. Kennt. Kohle* 5, 377-406(1920).—The solvent action of NH<sub>3</sub> and of Na carbonate and hydroxide differs probably owing to the differing facility of hydrolysis of anhydrides in the peat. Water-sol. products amounting to 50% may be obtained, as well as traces of CO<sub>2</sub>, and also water. As the peat ages, the proportion of humic acids and residue insol. in alkali increases, but there is an optimum temp. for the max. yield of the former. In peat formations it seems as though anhydride formation precedes production of humic acids.

J. S. C. I.

**Deposits of pure humic acids in peat (dopplerte).** W. SCHNEIDER. *Ges. Abhandl. Kennt. Kohle* 5, 541-2(1920); cf. Tideswell and Wheeler, *C. A.* 17, 1121.—In a sample of peat (St. Martinszeche, Kohlgrube, Bavaria) was found embedded a gelatinous black mass contg. 75% of water and 5% of ash. On distn. it gave no tar, but dissolved in caustic soda soln. after 24 hrs. in the cold and more rapidly when heated. It is probably the Ca salt of a pure humic acid (dopplerte).

J. S. C. I.

**Drying peat by hot filtration.** LAFFARGUE. *Chaleur et industrie* Sept. 1922; *Industrie chimique* 10, 213-4(1923).—The peat is driven by pistons through tubes towards an autoclave, near the walls of which the tubes are perforated, so that the steam pressure in the autoclave forces out the water. The peat is discharged in briquet form. By choosing a suitable temp. there is a certain amt. of distn. of the peat, with formation of by-products which can be recovered; e. g., NH<sub>3</sub>, urea, etc.

A. PAPINEAU-COUTURE

**Peat.** T. LINDEMAN. *Norges Geol. Undersøkelse* No. 105, 32 pp. (1922).—When freshly dug, peat contains 85-90% H<sub>2</sub>O which cannot be pressed out on account of the colloidal nature of its humus content. Methods for breaking up this colloidal

structure, *e. g.*, elec. treatment and superheating, were tested and abandoned. Freezing before drying makes ordinary air-dried peat worthless, as it loses its cohesiveness and does not dry in hard cakes. This is due to loss of colloidal structure and frozen peat can, by pressing, be dehydrated to a  $H_2O$  content of 50-60%, after which it may be further dried by heat and briquetted. These briquets have  $2\frac{1}{2}$  times the heating value per unit vol. of the air-dried peat, and may be shipped and used as a coal substitute.

S. GULBRANDSEN

**Cannel coal and carbonaceous shale deposits of Pennsylvania.** C. R. FETTER. *Trans. Am. Inst. Mining Met. Eng.* No. 1233-p, 13 pp. (1923).—The important cannel coal and cannel shale deposits of Pa. are described as to geol. occurrence, microscopic structure and oil-yielding qualities. Lab. distn. of typical cannel coal (upper Kittanning) gave 50.1 gals. of crude oil and 2.8 gals. of light oil (recovered from gas) per ton. The yields from Lower and Upper Freeport cannel shales were 37.5 and 38.2 gals. of crude oil together with 2.4 and 2.6 gals. of light oil, resp. The results of analytical distn. of the crude oils and the percents of satn. in the fractions are given. Oil distd. from Pa. cannel coals and shales was commercially refined prior to the advent of the petroleum industry. The present tonnage of these materials is unimportant for the basis of an extensive oil industry.

E. T. ERICKSON

**Investigation of bituminous coal from Spitzbergen and Andö.** J. GRAM. *Norges Geol. Undersökelse* No. 111, 32 pp. (1922).—Coal from King's Bay Co. mines in Spitzbergen resembles cannel coal; the H content is 6% and the yields of coke and combustible volatile material are both about 50% on a dry and ash-free basis. It contains 18% ash and 4.5% S. Low-temp. distn. at 400-600° on lab. scale yields 20.6% oil, similar to petroleum, and 66.5% "half-coke." The oil on redistn. gives: light oil (80-200°) 5.5%, middle oil (200-300°) 26.0%, heavy oil (above 300°) 63.2% and paraffin 5.2%. The gas yield is 73 l. per kg. coal. Coal from Andö contains 39% ash and 8.6% S, and gives on a dry and ash-free basis, 37% coke and 63% combustible volatile matter. Low-temp. distn. gives 17.1% oil. Oil shales from Andö also were tested but were not amenable to treatment in the lab. app. Expts. on a larger scale were undertaken with a rotating retort, externally heated, with coal from a new vein from Spitzbergen, with an ash content of 12.8%, S 1.6% and yielding 18.8% oil on distn. This oil on redistn. gave 19% below 240°, suitable for motor fuel, and 64% heavy oil (240-360°) contg. 10.8% paraffin. The Norwegian government's Raw Materials Committee, with the purpose of developing a supply of oil, has ordered an installation from Julius Pintsch, Berlin, which will give 2000 tons oil per year. It will be installed at an industrial plant at Kirkenes and the coke and gas will be used for boiler fuel. This plant can be developed ultimately to an output of 12,000 tons per year. If this commercial expt. is successful it is hoped that a multiplication of such plants will result in the production of a substantial portion of Norway's oil requirement.

S. GULBRANDSEN

**Gaseous combustion at high pressures.** W. A. BONE. *Gas World* 78, 439-40; *Engineering* 115, 625-6; *Chem. Age* (London) 8, 541 (1923).—The object was to measure the change in pressure when simple gases such as H and CO were exploded in a bomb at an initial pressure of about 50 atm. When a H-air mixt. was exploded the max. pressure was reached in about  $\frac{1}{100}$  sec. while a similar mixt. of CO and air took  $\frac{1}{4}$  sec. to reach the max., also the cooling in the case of the H-air mixt. took place immediately, whereas in the latter case the cooling was delayed for an appreciable time, thus showing that heat energy was being liberated long after max. pressure had been reached. By exploding CO with O in presence of either N, O, A or H in definite and varied amts., the times taken to reach the max. pressures in the case of O, H, and small amts. of A diluents, did not differ greatly from those obtained with H-air mixts., whereas the N mixts. were much slower, the length of time required to reach the max. pressure being appreciably affected by the amt. of N present. The washings from the bomb after an explosion of a N mixt. showed plainly the presence of  $HNO_3$ . Com. possibilities were seen in the production of  $HNO_3$  by explosion of blast-furnace gases free from H with air in a bomb.

J. L. WILEY

**Comparative methods of debenzolizing wash oil and the recovery of wash oil from blast-furnace gas.** F. D. WHITTAKER. *Gas World* 78, No. 2024 (Coking Sec.), 15-8 (1923).—Two methods are compared. One is a comparatively low-temp. method.

J. L. WILEY

**Seaboard liquid purification process.** F. W. SPERR. *Gas Age-Record* 51, 639-40 (1923).—Comments on paper by H. R. Broker (*C. A.* 17, 2183).

J. L. WILEY

**Surface combustion with special reference to recent developments in radiophragm heating.** W. A. BONE. *Gas J.* 162, 423-8 (1923); *Gas World* 78, 405-9; cf. *C. A.* 8,

3358; 16, 2021.—It has been proved previously that: According to their chem. nature and physical texture all hot surfaces, at temps. below ignition point, have the power of accelerating gaseous combustion in different degrees; at high temps. this difference in power of acceleration practically disappears; during combustion the chem. action occurs mainly in, and is usually confined to, the boundary layers between the gaseous and solid phases; the accelerating influence rapidly increases with rise in temp.; and all surface combustion depends upon the absorption of the combustible gas, and probably the O by the surface, thereby becoming activated through assoc. with the surface. These discoveries were applied to industrial purposes and in particular to an installation of 2 boilers at the Skinningrove Iron Works fired on this principle with coke-oven gas (cf. *C. A.* 8, 1863). A radiophragm was devised which consisted of a porous diaphragm of refractory material through which was forced a homogeneous mixt. of gas and air in the right proportions for complete combustion. This mixt. was burned at the front face of the diaphragm without flame, and maintained the surface there in a state of incandescence. Unfortunately, the radiophragm proved difficult to manif. and possessed the disadvantage of preignition when working at a temp. above 900°. Recent improvements have been made which have entirely eliminated this risk of backfiring even at much higher temps. The new radiophragms are being made in both flat and circular forms and are finding a wide variety of industrial applications, such as baking, cooking, metal-melting, water-heating, etc. The great advantage lies in the possibility of consuming large vols. of gas within a very limited space with the attainment of very high temps. and without the use of regenerators or a waste of gas.

J. L. WILEY

**Effect of carbon dioxide variation on boiler efficiency.** W. P. CREWS. *Elec. World* 81, 1218(1923).—The effect is shown of the superheat and CO<sub>2</sub> relation at various boiler ratings and the relation between superheat and CO<sub>2</sub> and efficiency at various ratings. It is advisable to maintain a max. CO<sub>2</sub>, keep superheaters clean and let the superheat come where it will. The gain in efficiency due to high superheat is not as reliable as that obtained with good combustion in a boiler and high CO<sub>2</sub> content.

W. H. BOYNTON

**Production of high-grade fuel gases by treatment of distillation gases with active carbon.** F. FISCHER, H. SCHRADER AND C. ZERBE. *Brennstoff-Chem.* 3, 370-2(1922).—A gas of high calorific value can be obtained from distn. gases by passing them over active C under high pressure, the absorbed gases being subsequently extd. by heating (*C. A.* 16, 2593). Further expts. show that the absorption is as efficient at normal pressures as at high pressures. Cooling the active C has no effect on the yield. Superheated steam is effective for removing all absorbed gas, but the calorific value of the gas evolved may be reduced owing to condensation of benzene with the steam. Simple heating to 300° is the most effective method.

J. S. C. I.

**Corrosion and other deposits in gas services.** B. RICHARDSON. *Gas J.* 162, 348-50(1923).—Corrosion is primarily due to the combined action of H<sub>2</sub>O, CO<sub>2</sub> and O on the ironwork of the mains. Corrosion deposits are most frequently found where excessive amts. of O and CO<sub>2</sub> are allowed to go forward into the services, and where the gas does not contain sufficient hydrocarbons to form a protective coating upon the mains. The most obvious cure is to limit the O content of the gas to the abs. minimum, and to keep the CO<sub>2</sub> as low as possible by avoiding over-pulling. It is advisable also to practice complete NH<sub>3</sub> recovery, as this forms with CS<sub>2</sub> products which are corrosive to ironwork. The deleterious effects of HCN have been exaggerated somewhat and it does not follow that corrosion will cease by removing it. However, it is desirable to remove it as far as possible, as it does assist in augmenting corrosion. The polysulfide process of the British Cyanides Co. is recommended as the most efficient and economical process to use. As to naphthalene removal, the preferable way is to wash it out of the gas with a suitable absorbent in a rotary scrubber. R. uses water-gas oil up to 35 gal. per million cu. ft. of gas. This reduces the naphthalene content per 100 cu. ft. from 8-16 grains at the inlet to nil at the outlet. The oil is afterwards used for carburetted water gas.

J. L. WILEY

**Making mixed gas in horizontal retorts.** J. RUF. *Bull. mensuel* 1923, 9-16; *Am. Gas J.* 118, 443-5, 458-9.—A 3:1 mixt. of coal gas and water gas, with a heating value of 4600 cal. corresponding to a yield of 38-42 cu. m. per 100 kg. of coal, is produced at Solothurn, Switzerland in modified horizontal through-retorts by coking coal at one end of the retort and steaming the incandescent coke at the other. The results are successful and the process is economically feasible.

J. L. WILEY

**Meter deposits and meter corrosion.** W. H. FULWILLER. *Am. Gas J.* 118, 446A (1923).—Meter corrosion, diaphragm deterioration, and gum formation are due to S

comps. which form corrosive acids, these in turn attacking the metal case and forming Fe salts which tan the leather and make it brittle. These salts also act as catalysts in the polymerization of unsatd. hydrocarbons, such as indene and styrene, in the presence of O, and in the formation of gums. Cf. Brown, C. A. 17, 869. J. L. WILEY

Some means of improving horizontal retort settings. G. M. GILL. *Gas J.* 162, 400-10(1923).—Silica retort settings and Congdon scrubber standpipes are recommended.

J. L. WILEY

Maintenance costs of continuous vertical retorts at Droylsden, Manchester, from July 1910 to May 1921. W. BUCKLEY. *Gas J.* 162, 414-20(1923); *Gas World* 78, 431-7.—A summary of the itemized maintenance costs gives 10.613 d. per ton of coal carbonized or 0.801 d. per 1000 cu. ft. of gas.

J. L. WILEY

Further developments and applications of the Tully plant. C. B. TULLY. *Gas J.* 162, 420-2; *Gas World* 78, 446; *Chem. Age* (London) 8, 538-9(1923).—CO i practically eliminated from town's gas by passing the gas mixed with steam and at a temp. of 400° to 600° over a catalyst and converting it into CO<sub>2</sub> and H. The CO<sub>2</sub> may be washed out, leaving a gas rich in H applicable to NH<sub>3</sub> synthesis. (This part of the process is patented by West, Jaques and Tully in Brit. patent 195,798 (*Gas J.* 162, 488-9).) The gas at this point analyzes as follows: H<sub>2</sub> 75.3%, CH<sub>4</sub> 17.2, C<sub>2</sub>H<sub>6</sub> 2.6, CO 1.3, N<sub>2</sub> 3.6. To avoid the waste of CO<sub>2</sub>, it is proposed to utilize the CO<sub>2</sub> and H for the production of CH<sub>4</sub> by catalytic means. This modification of the process may be combined with the low-temp. process for the carbonization of coal for producing semi-coke, oils, etc.

J. L. WILEY

Rincker complete-gasification plant. ANON. *Gas Age-Record* 51, 637-8, 652 (1923); cf. Buijs, C. A. 15, 3385.—This process produces 56,000 to 60,000 cu. ft. of 350-360 B. t. u. gas per long ton of bituminous coal. The heating value may be increased to 420 B. t. u. by spraying tar on the hot coke or to 450 B. t. u. by using heavy oils similarly. The plant can also be used to make blue water gas and, by using coke and oil, is said to produce a gas consisting of 98% H.

J. L. WILEY

Natural gas in 1919-1921. R. S. MCBRIDE AND E. G. STEVENS. *U. S. Geol. Survey, Mineral Resources of U. S. 1921*, Part II, 335-69(preprint No. 32, published May 22, 1923).

E. H.

Recent progress in the gas industry. A. GREBEL. *Bull. soc. encour. ind. nat.* 134, 130-7(1922).

E. H.

Use of refractory materials in gas works. C. M. GILL. *Gas World* 78, 416-8; *Engineering* 115, 696-8(1923).—England possesses a considerable resource in clay which could be employed to produce semi-silica or siliceous refractory materials not having the disadvantages of either fireclay or 95% silica material. Fireclay often shows too much after-contraction and too ready a tendency to soften under load, while 95% silica material as often shows too much after-expansion, necessitating special construction, besides the extra expense of the retorts having to be built up instead of molded, and the objectionable tendency of 95% silica material to spall. There is large opportunity for the production of a much larger quantity of semi-silica or siliceous material with a SiO<sub>2</sub> content of 76 to 92% according to the position in the setting and the purpose for which it is required. The same class of material might also be used with great advantage for producer arches and walls and for the crowns of the arches in horizontal settings. At least 75% of the material required for building modern retort settings should be of a quality showing not more than 1% max. expansion or contraction at 1350° to 1400° under load, the remaining 25% showing not more than 1% max. expansion or contraction at 1280° under load.

J. L. WILEY

Gas coke as an industrial fuel. HENRI DÉCIUY. *J. usines gaz* 47, 117-9, 135-41 (1923); cf. C. A. 16, 821.—The properties of gas coke and its utilization as fuel under steam boilers are discussed.

J. L. WILEY

Ozonization of paraffin wax and montan wax (FISCHER, SCHNEIDER) 22. The denaturing of alcohol (BARON) 16.

Fuel. F. BRADLEY. *Brit.* 189,515, Aug. 29, 1921. A compn. fuel comprises a base of non-combustible material such as chalk, pit mound deposit, or clinkers, mixed with petroleum oil, preferably crude petroleum, and with glue to act as binding medium. Specified quantities of chalk, etc., and oil may be first mixed and the glue, dissolved in boiling H<sub>2</sub>O, added subsequently, the compd. then being left to dry. When burnt the substance remains as a cake, and, in the case of chalk as the solid ingredient, consists of quick lime.

**Motor fuel.** B. H. MORGAN. Brit. 189,715, Apr. 22, 1922. A fuel for internal-combustion engines comprises a mixt. of alc. and ether to which is added castor oil preferably in proportions of 0.2-5%.

**Comminuting fuel.** W. L. McLAUGHLIN. U. S. 1,458,106, June 5. Fuel such as coal, peat, culm or sludge is comminuted and dried and then further pulverized to an impalpable powder which is carried from the crusher by a slowly moving current of air from which the fuel is afterward sepd.

**Briquetting coal.** W. BROADBRIDGE, E. EDSEER and W. H. BEASLEY. Brit. 189,221, Aug. 24, 1921. In order to produce briquets from powd. coal or from froth flotation concentrates by a cold process, a binding agent consisting of pitch which contains naphthalene or phenanthrene is used, a mobile pulp of the coal and  $H_2O$  being agitated therewith at normal atm. temp., producing an intense flocculation of the coated coal particles. In an example Powell Duffryn duff was concd. by froth flotation, the agents added being  $\frac{1}{3}$  lb. of cresol and  $\frac{1}{3}$  lb. of paraffin per ton of duff. To the pulp removed as froth was added molten binding agent contg. 5% of pitch and 2% of naphthalene on the coal, and the mixt. was agitated to flocculate the coal particles. The flocculated material was then briquetted. Cf. 155,875 and 185,216.

**Briquetting coal.** W. BROADBRIDGE, E. EDSEER and W. H. BEASLEY. Brit. 189,200, Aug. 24, 1921. Finely divided coal, such as those coals which are not amenable to the flocculation process described in 155,875, is suspended in  $H_2O$  contg. mineral acid or treated with dil. mineral acid, preferably  $H_2SO_4$ , and subjected in aq. suspension to agitation, preferably with aeration, with liquefied binding medium, whereby the particles are coated and flocculated so as to be readily separable from  $H_2O$ . In an example, slack obtained from Ashington Colliery, Northumberland, was subjected to froth flotation concn., the reagents being cresol and paraffin in amts. of 1 lb. and  $\frac{1}{2}$  lb., resp. per ton of slack. The concentrate in pulp form was mixed and agitated with 2% of tar and 5% of pitch (on the wt. of coal without  $H_2O$ ), and with 2.4 lbs. of  $H_2SO_4$  per ton of concentrate. The flocculated material was compressed into briquets. Cf. 104,865, 139,977 and 163,042.

**Briquets.** MASASUKE MITSUNAGA and THE MITSUBISHI KOGYO KABUSHIKI KAISHA. Japan. 41,237, Dec. 22, 1921. By mixing with about 10% hydroxides of alk. earth metals, especially  $Ca(OH)_2$ , soy-bean refuse acquires a large vol. and powerful combining power, the fact of which is utilized for the manuf. of briquets. Fifty kg. of soy-bean refuse are immersed in 200 l. of  $H_2O$  and mixed well with 5.5 kg. of  $Ca(OH)_2$ ; then the mixt. is completely mixed with 1000 kg. of powd. coal. It is pressed into molds by a pressure of 150 kg. per sq. cm. and dried.  $H_2AsO_3$ , naphthalene or camphor oil may be used as antiseptics. The product is very hard and waterproof. The resistance to elongation is about 6 kg. per sq. cm. It burns completely.

**Horizontal retort furnace adapted for low-temperature coal distillation.** C. V. McINTYRE. U. S. 1,457,083, May 29.

**Distilling carbonaceous materials.** T. G. IRONSIDE. Brit. 189,542, Sept. 1, 1921. In the distn. of carbonaceous material such as shale, coal, lignite, wood or liquid hydrocarbons, the material is mixed with a heated granular substance such as sand, which supplies the necessary heat. A suitable construction is specified.

**Filter for fuel oils.** K. J. E. HESSELMAN. U. S. 1,456,438, May 22.

**Gas.** F.-G. LILJENROTH. Brit. 189,789, Nov. 29, 1922. In a method of obtaining H or gas mixts. contg. H the water-gas process is combined with the electrolytic production of H so that the O obtained in the latter process together with steam with or without an addn. of air is supplied to a water-gas generator, enabling the generator to be operated continuously. Any small % of N may be obtained when the gas is to be used for the synthetic production of  $NH_3$ . The H produced in the electrolytic plant may be mixed with the water-gas produced to obtain a gas for heating purposes. The CO may be sepd. from the other constituents of the water gas and used for heating purposes and the remaining gases mixed with electrolytically produced H. The gases supplied to the generator may be preheated electrically or by utilizing the heat of the hot gas leaving the generator.

**Gas.** G. HELPS. Brit. 189,475, May 26, 1921. A low-grade gas, having a relatively high N content such as producer gas, is mixed with such a vol. of O that when the mixed gas is burned completely in air the total vol. of N present in the ultimate mixt. approximates to or is less than the total vol. of N usually found in mixts. of high-grade gas such as coal gas and air for complete combustion. This O may be added to the low-grade gas after manuf. and prior to combustion or to the air used in a gas producer. Cf. 15,621, 1886, 16,142, 1889, 5,149, 1901 and 127,916 (C. A. 13, 2436).

**Ammonia liquor from by-product coke-oven gas.** L. E. DORV. U. S. 1,457,877,



June 5. By-product coke-oven gas is cooled to form condensates of tar and  $\text{NH}_3$  liquor which are collected and sepd. from each other. The  $\text{NH}_3$  liquor is removed from the circulating system, the tar is recirculated through the gas mains and fresh  $\text{H}_2\text{O}$  is added to the gases prior to cooling them to absorb  $\text{NH}_3$  and form  $\text{NH}_3$  liquor.

**Coke.** W. BROADBRIDGE, E. EDSEY and W. H. BRASLEY. Brit. 189,506, Aug. 24, 1921. Finely divided coal is suspended in  $\text{H}_2\text{O}$  and the mixt. is subjected to agitation and aeration with a liquefied binding medium so as to coat and flocculate the coal particles, and the flocculated material is then briquetted and coked. In the case of certain coals which resist flocculation, the coal is treated with dil. mineral acid, preferably by adding a small proportion of  $\text{H}_2\text{SO}_4$  to the circuit liquor itself. In one example, slack from Ashington Colliery, Northumberland, was concd. by froth flotation, the agents being 1 lb. of cresol and  $\frac{1}{4}$  lb. of paraffin per ton of slack. The concentrate was agitated and heated; to the pulp was added 2.4 lbs. of  $\text{H}_2\text{SO}_4$  per ton of concentrate and tar equiv. to 7% on the concentrate. The flocculated material was compressed and coked. The finer portions of the concentrate of another coal were sepd. and flocculated, the binding medium consisting of pitch and tar, and the coarser particles were introduced during the agitation. The briquetted material was coked in a silica pot heated for 2 hrs. in an elec. furnace, the temp. gradually rising to  $1040^\circ$ . Cf. 155,875.

**Quenching coke.** A. MORTRELL. U. S. 1,457,713, June 5. Heat recovery from coke or like distn. residues is facilitated and temp. differences are equalized by cooling residues from a plurality of distn. vessels or retorts in a common cooling or quenching chamber from which heat and materials may be withdrawn as required.

**Purifying anthracene press cake.** H. D. GIBBS. U. S. 1,456,848, May 29. Anthracene press cake is heated with an alkali such as NaOH to convert the carbazole present into a salt, further heated to sublime anthracene and other materials and the sublimate is collected.

## 22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

**Petroleum in 1919-1921.** G. B. RICHARDSON. U. S. Geol. Survey, Mineral Resources of U. S. 1921, Part I, 253-333 (preprint No. 31, published May 26, 1923).

**Proposed uniform terminology for petroleum and petroleum products, bitumens, asphalts and tarry products.** *Chimie et industrie* 9, 837-43 (1923).—Report of section B<sub>6</sub> of sub-committee B of the French permanent commission on standardization.

**Some present-day problems of the mineral-oil industry.** H. GAULT. *Mat. grasses* 15, 6429-39 (1923).—An address dealing with high- and low-temp. carbonization, cracking, and hydrogenation.

**Copper dish and doctor tests not so good.** J. V. MEIGS and E. J. FORD. *Refr. & Nat. Gasoline Mfr.* 2, No. 5, 6-7 (1923).—It is stated that the Cu dish test as used for corrosion is not representative of conditions to which the gasoline will be subjected in actual use and is too severe. Several proposed tests used in preliminary investigations made to substitute a more suitable test are described and discussed.

**Congealing temperatures of cracked residues.** J. C. MORRELL and G. EGLOFF. *Refr. and Nat. Gasoline Mfr.* 2, No. 4, 17-20, 33 (1923).—The sp. gr., viscosity and calorific values of several fuel and gas oils, topped crude oils, and the cracked residuums as obtained from these by the Dubbs process are tabulated and the results discussed.

**A melting-point bridge for petroleum shale oils and shale oil distillates.** L. C. KARRICK and V. F. PARRY. *Ind. Eng. Chem.* 15, 600-2 (1923).—A line of the oil to be tested is drawn by means of a stylus along a heat conducting rod, the temp. of each end of which is different and accurately measured. A point is detd. where the oil passes from the solid to the liquid state and the m. p. calcd. therefrom by the formula

$$(T_h - T_c)D/100 + T_c = m. p.,$$

where  $T_h$  is the temp. of the rod at the hot end,  $T_c$  the temp. at the cold end and  $D$  the distance in cm. from the cold end to the break in the oil line.

**Obtaining low-boiling hydrocarbons from higher-boiling hydrocarbons.** WILHELM SCHÜTTER. *Apparatus* 34, 91-2.

**Charcoal method of manufacturing gasoline.** C. L. VORHES, V. C. CANTER and R. W. SKOOG. *Refr. & Nat. Gasoline Mfr.* 2, No. 4, 11-2 (1923).—A brief description of a charcoal absorption plant is given. The essential units of the plant are the power,

absorber and condensing units. The absorbing unit consists of 3 cylindrical drums filled with gratings which carry screens over which are placed layers of activated charcoal. In operation one unit is absorbing gasoline from the natural gas while one unit is being treated with superheated steam to expel the absorbed gasoline and the third unit is cooling preparatory to absorption again.

D. F. BROWN

**Blending distillates and gas condensates.** G. W. REID. *Refr. & Nat. Gasoline Mfr.* 2, No. 4, 14-7(1923).—The theories and practice of blending petroleum distillates and casinghead gasoline are discussed.

D. F. BROWN

**Hovey process keeps carbon in suspension.** W. A. MANION. *Refr. & Nat. Gasoline Mfr.* 2, No. 3, 22(1923).—The chief feature of the Hovey cracking process is that C is kept in suspension by means of agitation from the injection of superheated steam through a perforated spray pipe at the bottom of the still. The steam is introduced at a temp. slightly above that of the oil in the still. Vapors pass into 2 towers in series, the first of which is maintained at a temp. too high to permit condensation of the steam. The second tower is trapped to permit drawing off water condensate and to allow the return of any of the oil condensate desired to the still.

D. F. BROWN

**Electric sparks used in the Stevens process.** E. W. STEVENS. *Refr. & Nat. Gasoline Mfr.* 2, No. 3, 17-20(1923).—Oil is cracked at atm. pressure by passing from a still through a hydrogenating cylinder contg. a series of tubes filled with catalyzing material and arranged to subject the oil therein to a high tension elec. discharge. A high rate of conversion is claimed and it is stated that aromatic hydrocarbons may be produced in large amts. by proper temp. control.

D. F. BROWN

**Jenkins cracking process found profitable.** H. R. HRYNE. *Refr. & Nat. Gasoline Mfr.* 2, No. 2, 8, 10(1923).—The main feature of the Jenkins process is its artificial circulation which keeps the oil under treatment in contact with the heating surface only long enough for the required cracking to take place. This reduces the amt. of C and non-condensable gases formed. Gas oil of 31-32° Bé. gravity, b. 525-785° F., and cold test 45, was charged in this process. Total charge, including 2160 bbl. of feed, was 2315 bbl. Pressure used was 105 lbs. Total cycle was 121 hrs. Total time between fire off and fire on, including cleaning, was 22 hrs. 78% of distillate was obtained, yielding 35% (on gas oil charged) of 120° F. initial b. p., 437° F. end point, 59° Bé. water white gasoline. Loss 3-5%. The total operating and treating charge per bbl. of charge was 25-30 cents.

D. F. BROWN

**Fleming unit has unusually large capacity.** H. S. BELL. *Refr. & Nat. Gasoline Mfr.* 2, No. 3, 10-1(1923).—In the Fleming cracking process the oil to be cracked is introduced at the bottom of a 10 X 30 ft. vertical still which is exposed over its entire surface to the heat from the furnace gases. Vapors pass overhead through a vapor line to a dephlegmator where they meet and are scrubbed by the incoming feed stock. The vapors from the dephlegmator pass to jet ejector type condensers where they are released under 2 cones of water. This results in the still being under a pressure of about 110 lbs. while the condensers are under a slight vacuum. 35-40% of 437° F. end point gasoline has been obtained under these conditions from 27-35° Bé. gas oil of b. p. over 450° F.

D. F. BROWN

**Newton process for recovering still gas.** B. V. ELLZEY. *Refr. & Nat. Gasoline Mfr.* 2, No. 4, 9-10(1923).—An absorption plant for recovering gasoline from either natural gas or still vapors is described. The absorber is divided into 3 horizontal compartments, the gas entering at the bottom and passing successively up through the oil level in each compartment under a pressure of from 1 to 100 lbs. (25 lbs. pressure is used in the units described), while the absorber oil enters at the top of the absorber. The absorber oil used is light oil of 60-64° Bé. gravity and is recycled through the app. so that only a small amt. of additional absorber oil has to be added from time to time to replace the natural loss. The satd. oil from the bottom of the absorber is pumped to a specially designed steam still where the light gasoline is taken off overhead and the bottoms are recycled to the absorbers.

D. F. BROWN

**Newer methods of obtaining benzene.** FR. MOSER. *Schweiz. Chem.-Ztg.* 1922, 604-6, 615-9.—A review.

E. H.

**Blown petroleum pitch.** D. HOLDE AND S. WEILL. *Petroleum Z.* 19, 451-2(1923).—The large sapon. no. of blown pitch is due not to the presence of esters but to the oxidation effect of the strong alc. caustic soln. used. In neither the blown pitch nor its cracked distillate were found noticeable amts. of fatty acids.

D. F. BROWN

**Ozonization of paraffin wax and montan wax.** F. FISCHER AND W. SCHNEIDER. *Ges. Abhandl. Kenni. Kohle* 5, 117-78(1920).—The waxes dissolved in  $C_2H_2Cl_4$  were ozonized at 50-60° for 24 hrs. and the wts. of acid products insol. in water detd. From preheated montan wax and a hard paraffin wax from lignite tar very little was obtained,

whereas the yield of acids from the paraffin wax of low-temp. tar, from montan wax, and from ozokerite was considerable. The difference is ascribed to the presence of straight or branched C chains, the latter being the more easily attacked by  $O_2$ .

J. S. C. I.

**Oxidation of paraffin wax with air at normal pressure.** W. SCHNEIDER. *Ges. Abhandl. Kennl. Kohle* 5, 129-31 (1920); cf. C. A. 15, 2737.—The claim made by Grün (C. A. 14, 3416) to have obtained a yield of 86% of fatty acid by oxidation with air for 12 hrs. is not confirmed. At 160° the yield was 10% and at 170° 14% only.

J. S. C. I.

**Retorting experiments on Norfolk shale.** ANON. *Petroleum Times* 9, 729-30 (1923).—A brief description of 10 expts. which have been carried out with different types of shale retorts at Setch, near King's Lane, England. The Scotch retort appeared to give the best results.

D. F. BROWN

**Economic study of the New Albany shale.** J. R. RERVES. *Bur. Mines, Repts. Investigations* No. 2466, 19 pp. (1923); cf. C. A. 17, 205, 1325.—Development of shale industry depends on several factors such as location in respect to market, climatic conditions, transportation facilities, labor supply, water supply. Utilization of oil shale is comparable to utilization of low-grade ore. Mining and prepn. for retort are important factors. Shale in this district averages about 100 ft. thick, yields 6-16 gals. per ton of oil of sp. gr. 0.931 (60° F.), 41.5% b. below 275°; the unsatn. of this fraction is 39.2%.

R. T. GOODWIN

**Detection of coal tar pitch in natural asphalt.** O. HACKL. *Chem.-Ztg.* 46, 1156 (1922).—A sample of natural asphalt, that gave no indications of the presence of coal tar pitch by extn. with  $CS_2$  or alc., gave a yellow alc. layer in Durand Claye's test (extn. of the asphalt with benzene, followed by shaking of the benzene soln. with alc.). It is concluded, therefore, that the latter test is liable to be misleading.

J. S. C. I.

**Report on turpentine.** J. O. CLARKE. *J. Assoc. Offic. Agr. Chem.* 6, 465-6 (1923); cf. C. A. 16, 3201.—A study of 2 methods of polymerization led to the recommendations that: the fuming  $H_2SO_4$  method be adopted as tentative in slightly modified form (as outlined in the report), the  $H_2SO_4-HNO_3$  method in the form published be made tentative, the method of Grotlich and Smith for the detn. of coal tar oils in turpentine be studied.

W. O. E.

Investigation of bituminous coal (and oil shale) from Spitzberger and Andö (GRAM) 21. Cannel coal and carbonaceous shale deposits of Pennsylvania (FETTER) 21. Production of H by the thermal decomposition of oil (WEAVER) 18. Formation of petroleum deposits (TRAUTH) 8. Oil deposits of the Magdalena Valley, Colombia (STRUTZER) 8. Theories on mineral oils (CORTYSH) 8. Distilling carbonaceous materials (Brit. pat. 189,542) 21. Distilling apparatus (Japan. pat. 41,270) 1. Concentrating liquids by hot gases (U. S. pat. 1,456,874) 13.

**Cracking hydrocarbons.** J. C. BLACK. U. S. 1,456,419, May 22. Oil to be cracked is preliminarily heated in coils arranged in series, to approx. the highest temp. to be employed in the cracking process and then passed through a final heating coil wherein the temp. is maintained at about this max. by supplying heat to compensate for that rendered latent by the cracking. After a prolonged heating, the material is conducted to a C-pptg. chamber in which the rate of flow is lessened to permit sedimentation while still maintaining the material under pressure. From the pptg. chamber the cracked products are led through a pressure-regulating valve to a fractionating app. Cf. C. A. 16, 3753.

**Cracking hydrocarbons.** HOOPER CO. Brit. 189,200, Aug. 22, 1921. In converting high-boiling hydrocarbon oils into lower-boiling oils by the action of  $AlCl_3$  or similar catalyst, the heated mixt. of oil and catalyst is circulated over heated surfaces and a part of the mixt. is withdrawn from the circuit and treated to sep. the  $AlCl_3$  which is returned to the circuit. A suitable construction is specified.

**Cracking hydrocarbon oils.** R. W. HANNA, W. D. MASON and W. G. HAMILTON. U. S. 1,449,226, Mar. 20. A lubricating fraction of Cal. oil or other heavy oil to be cracked is mixed with a solvent oil which will not be cracked under the conditions of the process and which is of a b. p. intermediate that of the desired light cracked product and that of the oil subjected to cracking. After preheating the mixt. to a temp. just below the cracking temp. it is further heated in a cracking app. where cracking is effected without any excessive local heating and then conducted to an evapg. unit. The circulation of the oil may be continuous and the app. may be operated under pres-

sure. U. S. 1,449,227 relates to a similar process in which the oil is circulated between evapg. and auxiliary heating units with sufficient rapidity as to maintain the oil in these units at about the same temp. A relatively small portion of the oil mixt. is heated in the auxiliary heating unit to a temp. but very slightly above that at which the main body of oil in the app. is maintained in the evapg. unit. This operation avoids local overheating. An app. is described. Cf. C. A. 16, 1663.

**Cracking petroleum oils.** H. M. LASHER. U. S. 1,457,068, May 29. A petroleum oil, *e. g.*, "topped" petroleum, is heated to a cracking temp. at low pressure (*e. g.*, a pressure of about that of the atm.) while NaCl is maintained in suspension in the oil to facilitate cracking.

**Desulfurizing petroleum oils.** A. E. DUNSTAN and F. B. THOLE. U. S. 1,457,656, June 5. See Brit. 186,955 (C. A. 17, 1137).

**Fractionating petroleum.** H. P. STRAUS. Brit. 189,239, Aug. 29, 1921. In fractionating petroleum, the vapors from a still are passed upwards through a column divided into a series of chambers by perforated plates on which rest metal balls, stones, or other coarse material. The liquids which condense in the chambers accumulate on the perforated plates, and are refluxed to the chambers below by pipes having bends or traps and terminating in perforated pipes immersed in the coarse materials. The vapors are withdrawn from the column by a pipe leading to a condenser or by branch pipes from the sep. chambers. Steam may be injected into the still after the lighter fractions have been distd. off. The walls of the column and the vapor pipe are insulator to prevent loss of heat. Cf. 3468, 1889, 20,434, 1889, 25,676, 1901, and 19,780, 1907.

**Gasoline from natural gas.** E. S. MERRIAM. U. S. 1,457,786, June 5. Condensable vapors from natural gas are absorbed in a menstruum such as oil and the more readily separable vapors are allowed to sep. and then passed through the menstruum while it is heated to sep. other readily separable vapors.

**Gasoline from natural gas or other gases.** A. VON GROBLING. U. S. 1,456,953, May 29. Natural gas or other gas yielding gasoline is maintained in countercurrent circulation with an absorbent liquid such as a heavy oil through distg., cooling and absorbing app. and the pressure of the gases at the different steps of the process is varied to produce heat changes for absorption and distg.

**Gasoline from natural gas.** C. C. REED. U. S. 1,456,570, May 29. In a liquid absorption medium, circulation is maintained between a pool of menstruum in an absorption chamber open for the escape of gas and a pool of heated menstruum in a still chamber open for the escape of gasoline vapor, through streams of different sp. gr. The 2 chambers are maintained at about the same level and the return pipe from the still is led out at a higher level than the point of ingress of the inlet pipe to the still and the return stream is cooled.

**Treating sludge acids.** I. HECHENBLEIKNER and F. J. BARTHOLOMEW. U. S. 1,457,030, May 29. Sludge acids such as are obtained in refining petroleum oils with  $H_2SO_4$  are concd. by heating the acid internally while retaining the C impurities in suspension in the acid and the material is afterward dild. for effecting sepn. of the impurities. Cf. C. A. 16, 3203.

## 23—CELLULOSE AND PAPER

CARLETON E. CURRAN

**Action of acetyl bromide on cellulose.** LÁSZLÓ ZECHMEISTER. *Ber.* 56B, 573-8 (1923).—Extracts from Z.'s *Diss. Zürich*, 1913. Uninjured cellulose fibers behave sluggishly towards AcBr, adding neither Br nor Ac groups appreciably, and their HO groups become reactive only as the carbohydrate dissolves, but the process of soln. itself involves a deep-seated degradation. The acetylotic degradation of the dissolved cellulose is not brought about by the AcBr alone, the acid impurities (HBr and AcOH) always present in even the best com. samples playing an important role in that they effect the degradation to a stage which no longer withstands the action of the AcBr. When dehydrated cotton is treated with purified AcBr the process of soln. is extraordinarily retarded, not being completed in 9 days, whereas with com. AcBr, especially in sealed tubes so that the mixt. remains exposed to the action of the HBr, there is rapid degradation to the monose stage. In another series of expts. the AcBr w. s brought to varying "degrees of hydrolysis" by addn. of the calcd. amt. of  $H_2O$  and the degradation of the cellulose followed by detg. at a given moment the amt. remaining undissolved and the amt. and compn. of the material pptd. from the soln. by  $H_2O$ . The degradation increased with increasing hydrolysis of the AcBr; thus with AcBr hydrolyzed 0, 5 and

10%, resp., the amt. of cellulose remaining undissolved was 75, 17.5 and 10% and the % of Br in the material pptd. by  $H_2O$  was 1.4, 6.0 and 12.0. On the simple assumption that the AcBr converts into acetobromo derivs. the products (of decreasing mol. wt.) gradually formed during the process it would be expected that with increasing acetolysis there would be a rapid increase in the Br content but only a small decrease in the Ac no. of the resulting products, and such proved to be the case. Thus, in 1 case, the material pptd. by  $H_2O$  after 3.5 hrs. contained about 0.5% Br and 43% Ac, and after 2 days 14% Br and 39% Ac. The degradation is therefore a complicated interplay of the actions of AcBr and HBr. Wood also dissolves in AcBr without a residue and ice  $H_2O$  ppts. light, granular brominated products. C. A. R.

**Mannose from white spruce cellulose.** E. C. SHERRARD AND G. W. BLANCO. *J. Am. Chem. Soc.* **45**, 1008-13(1923).—As mannose cannot be isolated from white spruce wood or cellulose as a mannan, as it persists in cellulose prepd. by use of the most vigorous reagents and as when it is removed from the cellulose by hydrolytic means an equal or greater quantity of glucose is removed simultaneously, S. and B. conclude, for the present at least, that it is attached to the cellulose residue in much the same way as is a portion of the glucose. It is not attached as firmly as all of the glucose residues, however, a fact rather supporting the view that cellobiose constitutes the nucleus of white spruce cellulose as well as of cotton. C. A. R.

**Reply to Mr. Wilhelm Traube on his remarks on cellulose-copper compounds.** KURT HESS AND ERNST MEISSNER. *Ber.* **56B**, 587-91(1923); cf. T., C. A. **17**, 1217.—Polematical. C. A. R.

**The stability of cellulose esters.** ABEI, CAILLÉ. *Bull. soc. ind. Rouen* **50**, 382-4 (1922).—In the nitration and acetylation of cellulose there are formed mixed sulfuric-nitric and sulfuric-acetic esters. By dilg. the latter and heating slightly they are transformed into acetates sol. in  $Me_2CO$  and in  $MeOAc$  by partial sapon. of the sulfuric ester; and the technical cellulose acetates are really mixed esters having a low combined  $SO_3$  content. A. PAPINEAU-COUTURE

**Effect of heating cellulose and lignin under pressure in presence of water and aqueous alkalis.** F. FISCHER AND H. SCHRADER. *Ges. Abhandl. Kennt. Kohle* **5**, 332-59(1921).—At  $200^\circ$  in presence of water some decompn. of cellulose occurs and it increases with temp. The products are acids and other substances sol. in water, gases, and a solid residue, which at  $300^\circ$  amounts to only  $1/4$  of the original cellulose. Lignin yields some  $CO_2$ , but chiefly a black coal-like residue. Heating induces a mol. condensation in sulfite-cellulose waste liquor, a black insol. powder sepg. Neither cellulose nor lignin yields much humic acid. When heated in alkalis cellulose proves the more resistant, but at  $300^\circ$  it is extensively decomposed, yielding  $CO_2$ , an oil, and lower fatty acids. Lignin, even at  $200^\circ$ , is entirely decomposed, the whole passing into a soln. with characteristic odor, which when heated to  $200^\circ$  deposits a dark-colored ppt. J. S. C. I.

**Effect of heating under pressure the alkaline solutions obtained in the pressure oxidation of cellulose and lignin.** F. FISCHER, H. SCHRADER AND W. TREIBS. *Ges. Abhandl. Kennt. Kohle* **5**, 311-8(1921).—When heated to  $400^\circ$  in soda soln. under pressure the Na salts obtained by the pressure oxidation of 100 g. of dry cellulose at the same temp. produced 6.5 l. of gas, 1.5 g. of oil, 2.7 g. of tar, 0.28 equiv. of volatile fatty acids, 0.014 equiv. of other acids. The corresponding products from lignin yielded 3.4 l. of gas, 1.6 g. of oil, 0.17 equiv. of volatile acids, including benzoic acid, 2.0 g. of humic acids, 1.7 g. of isophthalic acid, and 1.1 g. of other acids sol. in ether. J. S. C. I.

**Chemical breakdown of cellulose by pressure oxidation.** F. FISCHER, H. SCHRADER AND W. TREIBS. *Ges. Abhandl. Kennt. Kohle* **5**, 211-20(1921).—Cellulose, after pressure oxidation in soda soln. at  $200^\circ$ , gave a yield of acids equal to 42% of the weight taken; of this only  $1/2$  was oxalic acid and  $1/2$  AcOH, with a trace of formic acid; about  $1/4$  consisted of non-volatile acids sol. in ether. A little formaldehyde was identified—probably an intermediate product. The process is partly hydrolytic and partly oxidizing, so that possibly sugars are first formed and later oxidized. J. S. C. I.

**Highly compressed sulfite cellulose.** G. K. BERGMAN, E. ALMBERG AND K. E. EKHOLM. *Pappers och Trävarutidskrift Finland; Paper* **31**, No. 23, 9-12, No. 24, 9-11(1923).—Highly bleached sulfite pulp imported from Finland into the U. S. was found to give trouble in breaking and bleaching. Comparison with pulps prepd. in the usual manner showed practically no difference in chem. compn., color or strength, nor in bleaching qualities in lab. tests. Commercially, highly pressed pulp is more difficult to break up in the beater and requires more time to bleach. A. P.-C.

**Chemistry of pulps: a comparison of the chemical changes of Jack pine and aspen woods cooked by the soda process.** M. W. BRAY AND T. M. ANDREWS. *Paper Trade*

*J. 76*, 19, 49-51(1923).—The rate of the chem. changes taking place in the woods was greatest during the initial part of the cook. At the 2nd hour of cooking (after 1 hr. at max. pressure) the process is practically complete. Cellulose begins to decompose very appreciably  $\frac{1}{2}$  hr. before max. pressure is reached at  $110^{\circ}$ . During the early stages cellulose decomposes faster than lignin. Later on the rate of lignin removal is greater. The pentosan content of aspen is reduced rapidly during the early stages of cooking to a const. value of 7.7%. Pentosans are present in the wood in at least 2 forms: one readily removed from the cellulose nucleus by hydrolysis and the other held in a more stable combination with the cellulose.

**Abstracts and bibliography.** C. J. WEST. *Paper Trade J.* 76, No. 15, 215, 217 (1923).—A complete list of the contributions of the TAPPI Committee on Abstracts and Bibliography.

**Possibilities of electrification in the pulp and paper industry.** H. W. ROGERS. *Nat. Elec. Li. Assoc. Bull.* 10, 333-6(1923).

**The determination of bases in fresh sulfite liquors made from dolomite.** RUDOLF SIEBER. *Papierfabr.* 21, 235-6(1923).—The usual gravimetric methods for detg. CaO and MgO in fresh sulfite liquors made from dolomite are hardly suitable as rapid control tests. A volumetric method is described in which the MgO is detd. by adding 20-50 cc. 0.1 N Ba(OH)<sub>2</sub> soln. to a 10 or 20 cc. sample of the neutralized liquor, dild. to 200 cc.; the pptd. Mg(OH)<sub>2</sub> is removed by filtration and the excess Ba(OH)<sub>2</sub> titrated with 0.1 N HCl. One cc. of 0.1 N Ba(OH)<sub>2</sub> corresponds to 0.002 g. MgO. CaO is detd. by pptg. the oxalate and titrating with KMnO<sub>4</sub>. Tests comparing the volumetric with the gravimetric methods gave close agreement.

**Quick test to determine the brittleness of paper.** P. L. HOUSTON. *Paper Trade J.* 76, No. 15, 233, 235(1923).—The bursting strength test of the creased paper detcs. a more reliable value of the strength, brittleness and wearing quality than the ordinary bursting strength test without crease. H. recommends that a study be made to det. the best size and wt. of steel rolls to be used in the baby stack calenders for creasing the paper and the optimum number of creases to be made.

**Effect of atmospheric humidity in the physical testing of paper.** P. L. HOUSTON, F. T. CARSON AND R. S. KIRKWOOD. *Paper Trade J.* 76, No. 15, 237-51(1923).—Results are presented of an extended investigation by the Bureau of Standards into the effect of humidity changes on the properties of paper. Data and extracts from the literature indicate that the qualities are detd. by relative rather than by abs. humidity. Eleven grades of paper were tested for 9 properties at 8 relative humidities varying from 15 to 83%. The procedure for each test is given and results are discussed. Folding endurance, elongation and tearing resistance increase considerably with relative humidity; tensile breaking strength and bursting strength increase up to about 40% relative humidity and then decrease.

**Determination of the fiber content of paper.** E. O. REED AND R. R. MACHMER. *Paper Trade J.* 76, No. 17, 47-9(1923).—Results of cooperative microscopical analysis of papers submitted by the testing section of the U. S. Govt. printing office indicate clearly that the fiber analysis of paper has been well developed and that by experienced analysts the 3 methods tried out (count, Spence and Kraus, estn.) give fairly concordant results. Results by the Govt. Printing Office testing section by the count method are very satisfactory on each sample and compare very favorably with those of the other analysts. The method is described in detail.

**Testing and control process in paper making.** M. A. KRIMMEL. *Paper Trade J.* 76, No. 18, 57-62(1923).—Brief outline of the raw material, process, and finished product control tests carried out at the plant of the Hammernill Paper Co.

**Report on Schopper folding machines.** HELEN U. KIELY. *Paper Trade J.* 76, No. 19, 45-8(1923).—Report on a cooperative investigation into the accuracy of the machine, tolerances allowable and value of the results in valuating paper.

**Testing the sizing quality in paper with the Valley tester.** J. E. ALEXANDER. *Paper Trade J.* 76, No. 15, 187-91(1923); *Paper Mill* 47, No. 15, 76, 78, 80(1923); *Paper* 31, No. 26, 45-8(1923); *Paper Ind.* 5, 331-3(1923).—From use of the Valley tester for routine testing, A. concludes it cannot be used for comparing different grades of paper, that in order to get a reliable test on the same grade of paper the formation and the furnish must be absolutely uniform, and the main factors influencing results are formation of the sheet, furnish, and base weight. A curve shows the increase in sizing tests with the increase in base weight for a hard sized paper. A. attributes lack of uniformity to the mechanism of the penetration of the test soln. through the paper.

A. PAPINEAU-COUTURE

**Ink flotation versus Valley size tester.** M. L. CAUST. *Paper Trade J.* 76, No. 15, 191, 193(1923); *Paper Ind.* 5, 333-4(1923).—The relation between the 2 tests is shown by curves. The flotation method shows a penetration in about 1.5 to 3.5 (av. 2.5) times as many secs. as the Valley tester. Tests with the Valley tester can be made to check with an av. max. variation of about 9%, and with ink flotation with a slightly higher variation. Valley tests show better agreement when repeated after a few days than after several months. A. PAPINEAU-COUTURE

**Animal size as substitute for rosin size in paper manufacture.** ANON. *Farben- u. Pigment-Ztg.* 28, 1089, 1153-4(1923).—Review. F. A. WERTZ

**Ten difficulties experienced in engine sizing.** E. C. TUCKER. *Paper Trade J.* 76, No. 18, 47-9(1923).—An address on the troubles caused by hard water, calcium salts in stock, effect of heat, acidity of back water, soft white shavings, fillers, hot dryers, suction, heating the stock, and damp paper, with suggestions as to how to overcome them, followed by a general discussion of the points brought out by T. A. P.-C.

**Reduction of bleach cost by chemical control.** GEO. M. TROSTEL. *Paper Trade J.* 76, No. 17, 52(1923).—The important factors in producing easy bleaching soda pulp are (1) proper amt. of alkali required for the particular wood to remove all non-cellulose material without overcooking and (2) complete removal of all black liquor and dissolved non-cellulose material. Bleaching should be accomplished according to the bleaching properties of the pulp, which should be detd. before the stock reaches the bleaching system. The most important benefits are uniform color, no waste of bleach, and no over-bleached pulp. A. PAPINEAU-COUTURE

**Bleaching pulp at high consistency.** R. A. HAYWARD. *Paper Trade J.* 76, No. 15, 221(1923); *Paper Ind.* 5, 161-2(1923).—Results of mill scale operations with a Wolf bleacher are outlined. Best results were obtained at not over 85° F. Bleach consumption at 20% consistency was over 25% lower than at 6% consistency. Poor hemlock was put through the wood room without any special care in cleaning and gave a clean grade of pulp. Working on hard-bleaching stock, overall shrinkage was 5.3% for hemlock and 4.04% for spruce, and chem. shrinkage 4.37% and 3.11%, resp. At thinner consistencies the shrinkage is about 10%. Tests with soda and sulfate stocks showed low shrinkage and low bleach consumption as compared with bleaching at 4-5% consistency. A. PAPINEAU-COUTURE

**A new process for the production of pulp.** J. F. CLERE. *Schweiz. Tech. Ztg.* 20, No. 9(1923); *Papierfabr.* 21, 201-203(1923).—The De Vains chlorination process is described. It consists essentially of the following phases: (1) cooking of the raw material in an alk. soln.; (2) chlorination of the resulting material, using  $\text{Cl}_2$ ,  $8\text{H}_2\text{O}$ ; (3) dissolving of the chlorinated products in an alk. soln.; and (4) bleaching of the half-stuff with  $\text{CaOCl}_2$ . The chemicals, with the exception of  $\text{CaO}$ , are prepd. by the electrolysis of  $\text{NaCl}$ . A yield of superior pulp, contg. 90-95% of the cellulose in the raw material, is obtained. The process has given good results with different kinds of straw, as esparto and bamboo. J. L. PARSONS

**The conversion of fibrous raw material to pulp and textile fibers.** C. G. SCHWALBE. *Zellstoff u. Papier* 4, 73-6(1923).—A general article on the chem. processes involved in the manuf. of pulp or textile fibers from seed fibers, bast fibers, grass and wood. The methods in which  $\text{Cl}$  is used are reviewed. A commercially useful fibrous raw material must contain at least 30% cellulose; it should not be bulky and should be easy to collect. A plea is made for the application of the principles of colloid chemistry to the study of the chem. problems connected with the industry. J. L. PARSONS

**Some causes for the deterioration of the color of soda pulp upon aging.** C. S. HAMM. *Paper Trade J.* 76, No. 16, 47-8(1923).—In the aging of soda pulp discoloration increases as the alk. of the pulp increases. Low alk. can be maintained by careful control of the washing operation and the use of sufficient  $\text{H}_2\text{SO}_4$  at the end of the bleaching operation. A. PAPINEAU-COUTURE

**The coloring of paper.** ANDRÉ BELTZER. *Industrie chimique* 10, 106-9(1923).—Paper mills should equip themselves to manuf. their own dyes. The benefits to be derived therefrom are discussed. A. PAPINEAU-COUTURE

**Froth troubles in paper mills.** R. B. BEST. *Paper Trade J.* 76, No. 14, 75(1923); *Paper* 32, No. 1, 9, 22(1923).—Brief sketch of the causes of froth formation on the paper machine, with indications for its elimination. A. PAPINEAU-COUTURE

**The commercial utilization of sulfite waste liquors.** HENRI DU BOISTESSELIN. *Bull. soc. ind. Rouen* 50, 375-81(1922).—A brief review. A. PAPINEAU-COUTURE

**The study of paper-making materials.** A. B. GREEN. *Paper Trade J.* 76, No. 15, 223-9(1923); *Paper* 31, No. 26, 97-102(1923).—A plea for systematic study of raw

materials before and during transformation with a view to detg. scientifically the optimum working conditions to obtain desired results.

**Paper-making tests with various plants from Indo-China.** VIDAL AND ARIEBERT. *Congrès Production Coloniale Marseilles 1922*, 100-16.—*Rice straw*.—The material, in 3-5 cm. lengths, was charged in a spherical rotating boiler, sprinkled to remove earth and dirt, steamed 1 hr. at 1-2 atm. pressure, cooked 5 hrs. at 3 kg. per cm.<sup>2</sup> with 13% NaOH (on bone-dry straw) as 5° Bé. liquor, washed and debarked simultaneously with a fine-meshed washing drum, and bleached with 16% bleaching powder (4° Bé. liquor) giving 30% of pulp contg. some unbleached raw shives. After careful beating, owing to the fineness and softness of the fibers, it was engine-sized and loaded with starch, and run on the paper machine with some trouble due to sticking at the presses, giving a sheet with the following characteristics: thickness 0.10 mm., wt. 88 g. per m.<sup>2</sup>, breaking length in machine direction 2450 m., in cross direction 1868 m., av. 2159 m., bursting strength 0.950 kg., folding resistance very low. The pulp is especially suited for use as a filler, like esparto. The micrographic characteristics are described in detail.

*Imperata cylindrica* P. Beauv. (*Imperata arundinacea* (Cyrill.)). See Groud, C. A. 17, 1548. *Bamboo*. Nodes were removed and the internodes repeatedly put through a lab. crusher until they were practically the same size as esparto grass, cut into 5-6 cm. lengths, charged into a rotary boiler, steamed for 2 hrs. at 1-2 kg. per cm.<sup>2</sup>, cooked 7.5 hrs. at 4-4.5 kg. per cm.<sup>2</sup> with 15% NaOH as a 6° Bé. liquor, washed and debarked simultaneously, bleached with 16% of bleaching powder and 0.3% H<sub>2</sub>SO<sub>4</sub>, and washed, giving a 40% yield of pulp. It was beaten, engine-sized, and slightly loaded with starch and run on the paper machine without any trouble, giving a sheet with the following characteristics: thickness 0.1 mm., wt. 56 g. per m.<sup>2</sup>, color light cream, formation slightly wild, breaking length in machine direction 3357 m., in cross direction 1955 m., av. 2656 m., bursting strength 1.06 kg. It is soft and strong and would be suitable as a printing paper. The micrographic characteristics are described in detail.

A. PAPINEAU-COUTURE

**Use of rubber latex in making paper.** ISMAR GINSBERG. *Paper 31*, No. 24, 7-8 (1923).—Brief discussion of the potentialities which lie in the use of rubber latex in the manuf. of paper, with special emphasis on the elasticity conferred on the paper by the rubber. (Cf. Luttringer, C. A. 17, 1715.)

A. PAPINEAU-COUTURE

**Rubber latex in paper.** M. B. SHAW AND GEO. W. BICKING. *Paper Trade J.* 75, No. 26, 53-5 (Dec. 28, 1922); *Pulp Paper Mag. Can.* 21, 215-7 (1923).—Tests carried out on a semi-com. scale on book, wrapping and writing papers show that there seems to be a slight increase of bursting strength on book paper but that the variation of the other qualities seems to be within that of testing different runs. FREDERICK KAYE. *Paper Trade J.* 76, No. 9, 55 (1923); *Pulp Paper Mag. Can.* 21, 406 (1923).—K. takes exception to the results of Shaw and Bicking on the ground that they show conclusively that the latex used was deteriorated.

A. PAPINEAU-COUTURE

**Paper and cardboard from peat.** A. LAMBRETTÉ. *Papeterie 44*, 781-6, 921-5, 962-9, 1073, 1109-13 (1922); 45, 19-22, 158-65, 314-8 (1923).—A discussion of the economic possibilities of using various grades of peat for the manuf. of pulp and paper, with a description of a large no. of expts. on a semi-com. scale carried out by L. with alk., acid, and mixed processes of treatment, and a description of the properties of the various products obtained.

A. PAPINEAU-COUTURE

**Continuous cooking of vegetable materials under pressure.** RAYMOND FOURNIER. *Papeterie 45*, 270-4 (1923).—A brief discussion of the merits of such a process and the principle on which a suitable digester could be constructed. (Cf. C. A. 16, 1864.)

A. PAPINEAU-COUTURE

**Mitscherlich pulp.** A. S. M. KLEIN. *Paper Trade J.* 76, No. 20, 41-5 (1923).—A discussion of quality of wood, length and thickness of chips, acid strength, temp. and time of cooking, and steam consumption in cooking and drying Mitscherlich pulp, from the standpoint of European, and more particularly Scandinavian, practice, contrasting it with American practice.

A. PAPINEAU-COUTURE

**The peculiarities of photographic paper.** A. B. HITCHINS. *Paper Mill 47*, No. 15, 218, 220 (1923); *Paper 32*, No. 1, 5-6, 21 (1923).—Brief outline of the requirements of raw photographic stock, and of the results obtained by a large U. S. paper making firm (not named) in supplying the need caused by interruption of French and German importations during the war.

A. PAPINEAU-COUTURE

**Use of rosin in paper making.** A. E. LEICESTER. *Paper 32*, No. 2, 5-6, 24, 26 (1923).—Brief discussion of English practice, bringing out some of the difficulties encountered and outlining methods of overcoming them.

A. PAPINEAU-COUTURE

**Freeness testing in a newsprint mill.** F. W. BRADSHAW. *Pulp Paper Mag. Can.*



21, 375-9(1923).—A detailed description of the Green freeness tester and its use, and of the system of control used at the Kenogami Mill of Price Bros., showing how it was used to obtain uniform freeness of the stock "as run" on the paper machine. A. P.-C.

**Wax paper for packing hygroscopic tablets.** W. GRÖNEWALD. *Zellstoff u. Papier* 4, 87-8(1923).—Hygroscopic medicinal tablets, contg.  $(\text{CH}_3)_4\text{N}_4$  and theobromine, absorbed only 1.4% moisture, after a 1 day exposure in an atm. contg. 100% relative humidity, when wrapped in paper which had been treated with  $\text{Al}(\text{OAc})_3$  and  $\text{Al}$  soap and afterwards with glue, gum arabic, or dextrin. J. L. PARSONS

**Treated parchment paper as a substitute for goldbeaters' skins.** ANON. *Papier-Ztg.* 48, 972(1923).—Parchment paper is treated with a soln. made up in the following way: 1 kg. casein is added to 12 l. lukewarm  $\text{H}_2\text{O}$ ; after an hr. 120 g. borax in 2 l. hot  $\text{H}_2\text{O}$  is added to the casein soln. with stirring. When the casein is dissolved 40 g.  $\text{HCHO}$  in 1 l.  $\text{H}_2\text{O}$  is added. The soln. should always be alk. J. L. PARSONS

**Study of the experimental manufacture of condenser paper.** M. B. SHAW AND GEO. W. BICKING. *Paper Ind.* 5, 309-11(1923).—As a result of semi-comm. mig. tests, S. and B. recommend as follows: New cotton and linen cuttings, carefully cut and dusted (self-cleaning magnet roll being used to remove metal and conducting particles), should be used raw in the beater. Filtered water should be used, and pumps handling water and stock should be of non-corrodible material. The beater should have a stone or cement and quartz roll and bed plate. Supercalendering may be necessary to reduce the thickness and give denseness. A. PAPINEAU-COUTURE

**Paraffin wax from waste waxed paper.** ANON. *Paper Makers' Monthly J.* No. 4, 61, 179(1923).—The waste and cuttings are treated with steam and water in an open tank and when pulped are transferred to a beater and a 5% soln. of soap contg. some Turkey red oil is added. The wax is emulsified and can be removed without the use of volatile solvents. FRANCIS G. RAWLING

Chemical breakdown of coal, lignite, lignin and cellulose (FISCHER, SCHRADER)  
21. Deflocculating and reflocculating clay or other materials [for use as a filler for paper] (U. S. pat. 1,456,112) 19. Pump for fibrous liquids (Norw. pat. 34,416) 1.

**Cellulose.** A. R. DE VAINS. Brit. 189,561, Sept. 5, 1921. Lyes that have been previously used to lixiviate cellulosic materials are used as alk. lyes to dissolve the products obtained by the action of  $\text{Cl}$  on lignocellulose, or on a semi-paste of cellulose.

**Organic compounds from sulfite liquor.** AKTIESELSKAPET SULFITSPRIT. Norw. 34,835, May 1, 1922. For the decompn. of the ligninsulfonic compds. and the consequent pptn. of the lignites a certain concn. of  $\text{H}_2\text{SO}_4$  in the liquor is required. This is attained by conducting the liquor together with gas from the roasting furnaces into an autoclave supplied with an app. for spark discharging.  $\text{SO}_2$  is oxidized and  $\text{SO}_3$  absorbed by the liquor. The gas is then blown into the absorption towers. Cf. following abstr.

**Oxidation of sulfur dioxide to sulfur trioxide.** AKTIESELSKAPET SULFITSPRIT. Norw. 35,190, July 3, 1922. This is accomplished by spark discharges in a mixt. of  $\text{SO}_2$  and air, resp.,  $\text{O}$ , under a pressure less than 760 mm. Hg and at a temp. above  $50^\circ$ . Cf. preceding abstr.

**Sulfite waste liquor.** AKTIESELSKAPET SULFITSKUL. Norw. 34,954, May 22, 1922. The liquor is heated under high pressure in the usual way and neutralized with  $\text{CaCO}_3$ . Then lime milk is added until alk. reaction, whereby a pptn. of lignites is obtained.

**Protein and lignin products.** AND. H. KIER AND CO. LTD. Norw. 35,302, July 17, 1922. Products of this kind are obtained by mixing protein compds. with lignin compds., e. g., a soln. of sulfite char or the mother liquor obtained by the production of sulfite char.

**Purification of wood-pulp.** K. MØRK. Norw. 34,166, Feb. 13, 1922. A knot catcher that acts by giving the pulp current a minimal velocity without whirls, and moves off the impurities continuously.

**Pulping fibrous material by cooking.** J. D. TOMPEINS. U. S. 1,457,326, June 5. In digesting fibrous material such as wood chips with a soln. of sulfite, soda or  $\text{Na}_2\text{SO}_4$ , gases are withdrawn from the top of a digester and reintroduced into the bottom of the digester by a pump. Steam is introduced into the gases before they reach the pump and the  $\text{H}_2\text{O}$  of condensation is used as a compression medium for the gases in the pump.

**Benzyl cellulose and similar ethers.** H. DREYFUS. U. S. 1,451,330, Apr. 10. Cellulose is impregnated with about 4 mol. equivs. of  $\text{NaOH}$  in 50% soln., kneaded with 2-3 mol. proportions of benzyl chloride at  $50-100^\circ$  for 2 hrs. and then 6 more mol. equivs.

of NaOH is added in powd. form followed by a further addn. of 3-5 mol. proportions of benzyl chloride. A benzyl ether of cellulose is obtained sol. in  $\text{CHCl}_3$  and in  $\text{C}_6\text{H}_6$ . Benzyl bromide and solvents may be added to cellulose and alkali to effect a similar reaction. Various esters may be obtained depending on the amt. of benzyl chloride or bromide used for a given amt. of cellulose. The benzyl ethers may be used for making films, varnishes, filaments and celluloid-like articles generally. Cellulose methyl benzyl ether or homologs may be obtained in a somewhat similar manner.

**Benzyl-ethyl cellulose ethers.** H. DREYFUS. U. S. 1,451,331, Apr. 10. Cellulose is treated with NaOH and then with benzyl chloride and diethyl sulfate (which may be added alternately and in successive portions) to form a mixed benzyl-ethyl cellulose ether which may contain benzyl and ethyl radicals in various proportions and which is suitable for making filaments, films, varnishes or celluloid-like articles in general.

**Cellulose acetate.** J. O. ZDANOWICH. U. S. 1,457,131, May 29. A cellulose acetate suitable for the direct production of films or filaments by extrusion into a coagulating bath is prepd. by reacting on cellulose with a halogen acetic acid, *e. g.*, chloroacetic acid, which is produced, in the presence of the cellulose treated, from  $\text{HOAc}$ ,  $\text{Ac}_2\text{O}$  and  $\text{Cl}$ , in the presence of a large proportion of a non-pptg. solvent (*e. g.*,  $\text{HOAc}$ ) which may be about 9 times the amt. of the cellulose. The reaction is completed by addn. of a strong condensing agent such as  $\text{H}_2\text{SO}_4$  which is used in amt. not exceeding 2% the wt. of the cellulose.

**Recovering cellulose acetate from solutions.** J. M. KESSLER and V. B. SEASE. U. S. 1,456,781, May 29. A soln. of cellulose acetate is forced through small orifices into ether or other org. pptg. reagent to form filaments.

**Cellulose ester composition.** J. M. KESSLER. U. S. 1,456,782, May 29. A compn. adapted for the same uses as celluloid is formed of cellulose nitrate 3 parts together with about 1 part of a mixt. contg. triacetin 75-97 and diacetin 25-3%, substantially free from monoacetin.

**Treating waste paper.** R. A. MARR. Brit. 189,271, Sept. 12, 1921. In producing utilizable pulp from old printed or other paper, the material is heated to or near the b. p. in a soln. of soap and  $\text{NH}_4$ , for 5-20 min. Oleaginous matter contg. ink, pigment, and loading rises to the top and is skimmed off. A small quantity of oxalic acid is added to destroy any writing ink which may be present. The mass is then run to a beating engine and beaten for 2-3 min. with the beater roll raised. The roll is then lowered into the working position and the moisture is present. The process is particularly applicable to cellulose acetates and nitrates, or to mixts. of these esters. The soln. of an ester in  $\text{SO}_2$  may further be treated with a liquid in which the ester is not initially completely sol., such as an aliphatic alc.,  $\text{CCl}_4$ ,  $\text{C}_2\text{H}_5\text{Cl}$ ,  $\text{C}_2\text{H}_4\text{Cl}_2$ , Am acetate, gasoline, benzine, turpentine, and chlorinated oils, when it is found that on evap. the  $\text{SO}_2$  the ester remains in soln. in the added menstruum.

**Filter paper.** J. BAKER, SONS, & PERKINS, LTD. AND F. E. THOMAS. Brit. 189,562, Sept. 6, 1921. In the manuf. of filter papers capable of retaining very fine ppts. and colloidal matters, decolorizing carbons such as are sold under the registered Trade Marks "Norit" and "Eponit," and preferably in a very fine state of division, are incorporated with the paper pulp.

**Paper pulp from straw.** B. S. SUMMERS. U. S. 1,457,915, June 5. Vegetable straw is successively treated with  $\text{SO}_2$  or  $\text{Ca}(\text{HSO}_4)_2$  or other acid reducing agent and with an oxidizing alk. bath which may be formed of NaOH and a hypochlorite.

**Cooler for reclaimed liquor and gas in paper-pulp processes.** G. F. SHEVLIN. U. S. 1,457,941, June 5.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Some observations on the ignition of combustible gases by electric sparks. J. D. MORGAN. *Phil. Mag.* 45, 968-75 (1923).—A study of the conditions controlling ignition of an explosive gas mixt. by sparking. A  $\text{CH}_4$ -air mixt. was used for most of the expts. In general the view is confirmed that a given supply of heat must be furnished in a limited time, which depends on the sepn. of the spark gap, the voltage, and the shape of the electrodes. Most reproducible results could be obtained by charging an air condenser with an induction coil. The crit. gap sepn. could be controlled and was found significant to 0.0005 inch.

S. C. L.

**Monel metal as a material for flame safety lamp gauzes.** A. B. HOOKER AND R. A. KEARNS. *Bur. Mines, Repts. Investigations* No. 2468, 14 pp. (1923).—Gauzes

were tested in an unbonneted Seippel lamp by subjecting to horizontally moving explosive mixts. of natural gas and air in four different percentages, and with varying velocity. Corrosion tests were made by subjecting the gauzes to moist air for 2.5 weeks with varying humidity. Monel metal is as satisfactory for lamp gauzes as steel and does not corrode appreciably in moist air. D. E. S.

**Process for opening at a distance suspected explosive bombs.** G. A. LEROY. *Ann. fals.* 16, 147-8(1923).—The metal shell is connected to a conducting wire, given a coat of a suitable insulating varnish (or surrounded with a tightly fitting rubber tube); one or more rings of metals are laid bare by scratching off the varnish, and the shell is immersed in a suitable electrolytic bath. If a rubber jacket is used, CCl<sub>4</sub> can be poured into the bath to the level at which it is desired to cut the metal. A small d.c. is passed through the bath, with the shell as anode. A. PAPINEAU-COUTURE

**Danger of explosion in vessels for compressed and liquefied gases (SCHREITMÜLLER)**  
1. The decomposition of KClO<sub>3</sub>. I. Spontaneous decomposition (Brown, *et al.*) 6. Dinitrosoresorcinol (Orndorff, Nichols) 10.

**Explosive.** W. O. SNELLING. U. S. 1,456,341, May 22. An explosive which can be used in mining is formed of a detonating agent such as nitrostarch mixed with an oxidizing salt, *e. g.*, NH<sub>4</sub>NO<sub>3</sub> and NaNO<sub>3</sub>, and wood pulp impregnated with NaCl.

**Mixture for detonating explosives.** B. GROTTA. U. S. 1,453,976, May 1. A mixt. of high detonating power, which does not readily become "dead pressed" and is not readily affected by moisture, is formed of Hg fulminate 60, mercurous azide 20, and KClO<sub>4</sub> 20% which is used with a charge of about an equal amt. of tetryl or a similar base charge, *e. g.*, tetranitroaniline, nitrostarch, T.N.T., hexanitrodiphenylamine or cyclotrimethylenetrinitramine. Cf. C. A. 17, 883.

**Explosives.** DYNAMIT-AKT.-GRS. VORM. A. NOBEL & CO., AND P. NAOUM. Brit. 189,780, Nov. 27, 1922. Addn. to 140,746 (C. A. 14, 2265). Fire-damp-proof gelatinous nitroglycerin explosives are made with the addn. of a small % of a concd. soln. of easily sol. salt which contains no H<sub>2</sub>O of crystn. An example contains gelatinized nitroglycerin 26, satd. NaNO<sub>3</sub> or NaCl soln. 2.5, nitrotoluene 2, wood meal 1, NH<sub>4</sub>NO<sub>3</sub> 3.5, and NaCl 36.5%.

**Explosive.** GRUBERNES SPRÆNGSTOFFFABRIKKER A/S. Norw. 35,703, Sept. 11, 1922. S. fat, MnO<sub>2</sub> and resin are melted, whereupon KNO<sub>3</sub> and sago flour are added. The mass is cooled and ground finely. Then NH<sub>4</sub>NO<sub>3</sub> is added and mixed thoroughly. The mass is heated slowly in a closed vessel to a non-viscous liquid which is then tapped out and cooled.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

**Future possibilities in the production of methyl violets.** I. RAFFAËLE SANSONE. *Color Trade J.* 11, 51-3(1922).—A discussion of the properties, varieties, methods of manuf., purification and defects of the present processes. II. *Ibid* 97-100. Suggested improvements in the manuf. processes and plant. III. *Ibid* 193-5. The manuf. of methyl violet 6B and crystal violet. CHAS. E. MULLIN

**Dyestuff from the outer skins of onions.** B. GOLOUBTSCHIK. *Chem.-Zig.* 47, 6 (1923).—An aq. ext. of the outer skins of onions is used in the Ukraine for coloring eggs yellow or brown. Similar colors are produced on wool or cotton articles by boiling them in the soln. if they have first been soaked in dil. FeSO<sub>4</sub> soln. and then dried. The dye is fast to light, water, and chem. reagents. The strength of the iron soln. has no effect on the intensity of the color; extremely dil. solns. are, therefore, used. Wood may be tinted brown by first painting it with a dil. iron soln., then, after drying, with the hot ext. J. S. C. I.

**Dissolving dyes and handling (dye) solutions.** ANON. *Textile World* 63, 3485-6 (1923).—Use Cu or monel metal kettles large enough to allow boiling with live steam, with at least 2 gal. H<sub>2</sub>O per lb. dye. CHAS. E. MULLIN

**Dyeing of direct blacks on cotton piece goods.** RAFFAËLE SANSONE. *Am. Dyestuff Rept.* 11, 289-90, 295-6, 313-5, 471-6; 12, 95-6, 113-20(1923); cf. C. A. 16, 2608.—In the dyeing of direct grays it is difficult to imitate exactly a given shade. A continuous dyeing plant for grays is described, illustrated and considered to have the following advantages: A large no. of pieces of cloth can be dyed in one lot with identical shades, rinsing is unnecessary, a change from one dye to another is easily made, folds

in the cloth are avoided, as the cloth remains in the bath throughout the dyeing operations short baths are made by running at a greater speed, and a competent dyer can manage several units simultaneously as most of the work is automatic. A plant for dyeing light shades is described, its advantages being that with the same dye bath, by using 4 different speeds of operation, it is possible to produce a very light, light, medium and a dark shade of the same gray. The numerous squeezing rollers reduce the quantity of unfixed coloring matter left on the material, thus frequently avoiding the necessity of a subsequent rinsing. The dyeing operations can be conducted with stronger baths than in the other methods and the plant runs more rapidly with greatly increased production. The construction and operation of 3 varieties of plant for the dyeing of direct blacks as a ground to aniline black are described. A newer method for the production of compound shades is described with details for the layout and operation of a plant. Twelve advantages of this method are mentioned.

L. W. RIGGS

**Use of titanium oxide for printing fabrics.** PIERRE BINDER. *Bull. soc. ind. Mulhouse* 89, 196-8(1923).— $\text{TiO}_2$  is preferable to  $\text{Ti}(\text{OH})_4$ . It is worked into a paste contg. 50%  $\text{H}_2\text{O}$  and passing through a 250-mesh sieve and applied by means of albumin, viscose, or acetylcellulose in  $\text{AcOH}$  soln. The covering power is approx. 4 times that of the same wt. of  $\text{BaSO}_4$  and slightly greater than that of  $\text{ZnO}$ . A. P. C.

**Bleaching and dyeing of hair.** M. BACHSTEZ. *Color Trade J.* 11, 90-2(1922).—Live human hair is best bleached with peroxide solns., but even these alter the hair structure, rendering it brittle. Formulas are given for powders and greases used in temporarily coloring the hair. II. *Ibid* 191-2.—Pb in hair dye unites with the S in the hair to form insol. black  $\text{PbS}$ , but the Pb is detrimental to health. Ag compds. possess the dyeing advantages of the Pb compds. without their injurious properties. Ammoniacal  $\text{AgNO}_3$  solns. dye progressively, the action of the hair developing the dark color. The action is accelerated by pyrogallol,  $\text{Na}_2\text{S}_2\text{O}_3$  or  $\text{Na}_2\text{S}$ . 8-10 g. pyrogallol in 100 g. alc. and 250-350  $\text{H}_2\text{O}$  is used in connection with 5-18 g.  $\text{AgNO}_3$  in 20-45 g. 10%  $\text{NH}_4\text{OH}$  and 100-200 cc.  $\text{H}_2\text{O}$ ; or 100 g.  $\text{Na}_2\text{S}$  in 600 g. 96 or 48% alc. is used with 50-100 g.  $\text{AgNO}_3$ , 150-800  $\text{H}_2\text{O}$  and 150 g. 10%  $\text{NH}_4\text{OH}$ . Cu compds. have also been used with pyrogallol but are unhealthful.  $\text{Bi}(\text{NO}_3)_3$  200 g.,  $\text{Na}_2\text{S}_2\text{O}_3$  50 g. and  $\text{H}_2\text{O}$  400 is used for brown shades. Co, Ni, Fe and Mn are also mentioned. III. *Ibid* 270-3.—The natural nut ext. dyes, henna, reng and pyrogallol are discussed. Pyrogallol is injurious. *p*-Phenylenediamine, which works well with  $\text{H}_2\text{O}_2$ , is injurious. *p*-Aminophenol, *p*-aminodiphenylamine, *p*-diaminodiphenylamine, naphthylenediamine, *p*-tolylenediamine and the Na salts of *o*-aminophenolsulfonic acid and *p*-aminodiphenylaminosulfonic acid are mentioned as substitutes. "Aureol" is (A) metolmonomethyl-*p*-amino-*m*-cresol 1 g., aminophenyl-HCl 0.5 g., aminodiphenylamine 0.6 g.,  $\text{Na}_2\text{SO}_3$  0.5 and alc. 50 g. (B) 3%  $\text{H}_2\text{O}_2$  soln. Equal parts of A and B are mixed for use. IV. EDMUND SALLFELD. *Ibid* 12, 43-6(1923).—A general discussion of graying and dyeing.

CHAS. E. MULLIN

**Bleaching by means of sodium hypochlorite.** W. M. INMAN. *J. Soc. Dyers Colourists* 39, 78-81(1923).—A review of the theories of bleaching and a discussion of the relative values and advantages of the various hypochlorites under different conditions.

CHAS. E. MULLIN

**Apparatus for bleaching cloth in open-width.** JACOB RICHTER. *Color Trade J.* 11, 215-9(1922).—A description of the various types of app. with 10 illus. C. E. M.

**A new mordant to replace tannin: "katanol."** ANON. *L'Avenir textile* Jan. 1923; *Industrie chimique* 10, 215(1923).—"Katanol" is a powder sol. in  $\text{Na}_2\text{CO}_3$  soln., put out by Bayer & Co. It is fixed by cotton, forming an insol. compd. fast to washing. After mordanting the fabrics are washed and dyed with a basic dye at ordinary temp., or with a neutral dye at 50° or in  $\text{AcOH}$  soln.

A. PAPINEAU-COUTURE

**The use of antimony salts for fixing tannin.** CHARLES SUNDER. *Bull. soc. ind. Mulhouse* 89, 191-5(1923).—Tartar emetic (42%  $\text{Sb}_2\text{O}_3$ ) in the presence of  $\text{CaCO}_3$  has the same tannin-fixing power as Sb lactate (16%  $\text{Sb}_2\text{O}_3$ ). This is due to partial pptn. of  $\text{Sb}_2\text{O}_3$  by  $\text{CaCO}_3$  as a colloidal hydrate, which soon turns cryst. and rapidly settles out. On addn. of 0.5 part of  $\text{AcONa}$  (instead of  $\text{CaCO}_3$ ) for each part of tartar emetic it becomes as efficient as Sb lactate.  $\text{AcONa}$  partially ppts.  $\text{SbF}_3$ , but addn. of 25 parts of neutral Na tartrate per 100 parts of  $\text{Sb}_2\text{O}_3$  (as  $\text{SbF}_3$ ) prevents pptn. It would be more economical to use a mixt. of Sb tartrate with  $\text{SbF}_3$  or with Sb lactate.  $\text{SbCl}_3$  cannot be used instead of  $\text{SbF}_3$ .

A. PAPINEAU-COUTURE

**Constituents of raw cotton.** IV. E. KNECHT AND G. H. STREAT. *J. Soc. Dyers Colourists* 39, 73-7(1923); cf. C. A. 5, 3911; 6, 935; 13, 909; 14, 2860, 3324.—Three  $\text{C}_6\text{H}_4$  extns., with alternate HCl (d. 1.01 and 1.025) immersions, gave for American (A)

cotton 1.22%; Egyptian (E) 0.92%; Indian (I) 0.89%; Queensland (Q) 1.04%, a Nigerian (N) 0.96% of ext. The HCl solns. were colored brown; the ext. from Q by HCl amounted to 3.94%, and from N 5.74%; or a total extn. of 4.98% and 6.69% by  $C_6H_6$  and HCl from Q and N, resp. Raw cotton disintegrated by boiling 15 min. in HCl, d. 1.025, drying and powdering, when extd. with  $C_6H_6$  gave for A 0.74%; E 0.64%; I 0.67%; Q 0.60% and N 0.72% ext. Cotton mechanically disintegrated by grinding gave for A 1.20% and E 1.00% ext. Cotton extd. in the order named with alc. (a), benzene (b), and  $H_2O$  (c), gave for A, a 0.65%; b 0.18 and c 1.90; E, a 0.875; b 0.155; c 1.90; I, a 1.31; b 0.2; c 1.9; Q, a 1.83; b 0.29; c 2.07; and N, a 1.1; b 0.35; and c 1.75% ext. A quantity of crude cotton wax was examd. and substances called white solid C and D, and white cotton wax  $\alpha$  and  $\beta$  were obtained. It appears that only a portion of the cotton wax is on the exterior of the fiber, and that the remaining portion of it is only completely removed by disintegration of the fiber.

CHAS. E. MULLIN

**Mercerizing without shrinking without a mercerizing machine.** HENRI GROSHEINTZ. Sealed Note No. 1099, deposited March 28, 1899. *Bull. soc. ind. Mulhouse* 89, 198-200(1923).—The cotton is passed through NaOH at 38° Bé., rolled tightly, allowed to stand, and then unrolled in a dil.  $H_2SO_4$  soln. The process has been in use since March 1899. Report on above note. ANDRÉ MUSCULUS. *Ibid* 200-1.—The above process has apparently not been mentioned in patent or journal literature and seems quite original. The nearest approach is that of A. G. Bonbon who uses the min. amt. of NaOH required for mercerization.

A. PAPINEAU-COUTURE

**Materials used in the weighting of silk.** IV. EMILE CAGLIOSTRO. *Color Trade J.* 11, 78-80(1922).—The com.  $Na_2HPO_4$  may contain sulfate, chloride, carbonate and arsenate. In weighting, solns. contg. 130-200 g. per l. are used. In use the bath may contain Sn,  $HNO_3$  and  $NH_4OH$  as well as the above impurities. Chem. control methods are given. V. *Ibid* 125-7.—Turbidity in the phosphate bath due to silk gum dissolved from the fiber is not serious but that due to hard  $H_2O$  or  $SnP_2O_6$  will cause dulling and deprec. The bath should be alk. and is usually operated at 55-77° except in special cases and on soupled silk, where about 28° is used. Sn in the bath should not exceed 0.1% for yarns or 0.2% for piece goods. The excess Sn may be removed by treating the bath with  $MgCl_2$ ,  $CaCl_2$  or Na silicate soln.

CHAS. E. MULLIN

**Humidity in silk mills.** A. W. THOMPSON. *Textile World* 63, 3171-2(1923).—The fiber should contain about 11% regain, which is best maintained by 60-70% humidity at 21-24°.

CHAS. E. MULLIN

**The present state of artificial silk manufacture with special consideration of the copper oxide ammonia process.** ERLKENKAMA. *Deut. Faserstoffe u. Spinnpflanzen* 4, 61-3.

H. G.

**Kapok.** D. H. GRIST. *Malayan Agr. J.* 11, 3-27(1923).—The uses of kapok and its by-products are discussed. Kapok oil is closely related to cottonseed oil. Propagation, age of bearing, pests, and diseases, the harvesting and ginning of the floss are fully described.

W. H. BOYNTON

**Nettle fiber.** CHARLES SUNDER. *Bull. soc. ind. Mulhouse* 89, 187-90(1923).—Nettle fiber cannot be economically prepd. to compete with cotton, but could perhaps find a limited use as a substitute for ramie. Treatment with  $H_2O$  at 120-130° and with  $Na_2CO_3$  is not satisfactory. Fairly drastic treatment with NaOH gave 6% of soft fiber (on 200 g.). Nettle contains 85% ligneous matter, 9% incrustants and 6% fibers. The ligneous matter could probably be sepd. by suitable mechanical treatment, leaving only 15% for chem. treatment.

A. PAPINEAU-COUTURE

**The fire-proofing or flame-proofing of textile fabrics.** M. N. CONKLIN. *Color Trade J.* 11, 171-3, 259-60(1922).—A list is given of 31 compds. with the amt. of each necessary to render cellulose non-inflammable.

CHAS. E. MULLIN

**Heat-retaining properties of fabrics.** F. R. MCGOWAN and P. D. SALE. *Textile World* 63, 2607-9, 3041-3(1923).—A preliminary report describing the app. and methods used in the Bureau of Standards for detg. the heat transmission, air permeability and hygroscopic properties of fabrics.

CHAS. E. MULLIN

**Naphthalene as a wool preservative.** A. A. KLOOT. *S. African J. Ind.* 6, 39 (1923).—Colored wools often contain as much as 0.5% of Fe. Samples of discolored  $C_{10}H_8$  used in the tests contained traces of phenols. Wool impregnated with these and sweated in a steam oven developed slight stains. These stains do not develop with pure  $C_{10}H_8$  melting at 79°. The stain is more marked with wools in the grease. Pure  $C_{10}H_8$  to which 0.05% of phenol had been added, developed a marked stain. Wool impregnated with very dil. Fe soln., then treated with phenolic  $C_{10}H_8$ , developed a heavy stain, which resisted the usual chem. bleaches. Only pure  $C_{10}H_8$  should be used as a wool preservative.

L. W. RIGGS

Ash from cutch manufacture as a fertilizer (GREENSTREET) 15. Color designation, color measurement, fading and its measurement (TRILLICH) (BAWTREE) (LANG) (LOWRY, McHATTON) (HARMER) 2.

**Dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Brit. 189,782, Nov. 27, 1922. Thioindigoid dyes which dye animal and vegetable fibers in the vat are obtained by condensing  $\beta$ -thionaphthisatin (186,859, C. A. 17, 1029) with a cyclic compd. having a methylene group capable of reaction, *e. g.*, indoxyl, thioindoxyl, pyrazolone, acenaphthene,  $\alpha$ -hydroxyanthracene,  $\alpha$ -naphthol or a substitution product or deriv. thereof, and in some cases halogenating the products. Examples are given.

**Dyes.** L. CASSELLA & Co. Brit. 189,367, Dec. 29, 1921. Sulfuretted dyes of the anthraquinone series which dye vegetable fibers fast shades from the hyposulfite vat are obtained by heating 2-methylantraquinone, or a halogenated deriv. thereof, with an aromatic compd. contg. the *p*-diamine grouping, and S; in place of the *p*-diamine, compds. which yield *p*-diamines during the reaction may be used. Examples are given.

**Dyes.** A. G. DANDRIDGE, J. THOMAS AND SCOTTISH DYES, LTD. Brit. 189,834, Aug. 3, 1921. *N*-Dihydro-1,2,2'-anthraquinone or its derivs. are produced by fusing 2-aminoanthraquinone or its derivs. with KOH or other alkali at a temp. of about 200–240° in the presence of an inorg. salt or salts capable of acting as a reducing agent, whereby improved yields are obtained. The inorg. salts specified are cyanides, sulfides and ferrocyanides of the alkali metals. In an example, KOH is melted, K<sub>2</sub>S stirred in and the temp. raised to 200°. The 2-aminoanthraquinone is then added and the temp. finally raised to 220–240°. The mixt. is poured into H<sub>2</sub>O and boiled. Alternatively the sulfide and potash may be first mixed and then melted.

**Dyes, intermediate products.** BRITISH DYESTUFFS CORPORATION, LTD., J. BAD-DILEY AND E. H. RODD. Brit. 189,295, Oct. 5, 1921. Triarylmethane dyestuffs dyeing tannin-treated cotton in reddish violet to bluish violet shades are obtained by condensing 4,4'-dialkylidiamino-3,3'-dimethylbenzophenone with a secondary or tertiary amine using a condensing agent such as P oxychloride. Such dyestuffs as contain a phenyl, benzyl, or naphthyl group in the amino group may be sulfonated when they dye wool similar shades from an acid bath. Examples are cited.

**Dyeing composition.** B. C. LEONARDI. U. S. 1,457,581, June 5. A dyeing compn. which is suitable for use on silk is formed of a dye mixed with tartaric acid, Na<sub>2</sub>SO<sub>4</sub>, Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>, NaHCO<sub>3</sub> and lactose.

**Azo dyes.** A. L. LASKA AND A. ZITSCHER. U. S. 1,457,114, May 29. Dyes are prepd. by combining diazo compds., *e. g.*, those derived from a chloroaniline, dichloroaniline, chlorotoluidine, chloronitroaniline, nitroanisidine, chloroanisidine or nitrotoluidine, with the *o*-aniside of 2,3-hydroxynaphthoic acid, the *o*-phenetide of 2,3-hydroxynaphthoic acid or other *o*-alkoxyarylide of 2,3-hydroxynaphthoic acid. These dyes are generally of various shades of red, are suitable for the production of lakes and when formed on the fiber produce fast dyeings.

**Azo dyes.** D. DE MONTMOLLIN, G. BONHOYE AND J. SPIELER. U. S. 1,453,660, May 1. 4,4'-Dihydroxydinaphthylketone-3,3'-dicarboxylic acid when combined with the diazo compd. of 1-methoxy-2-aminobenzene-4-sulfonic acid produces a dye giving a slightly violet-red color on wool. A dye giving an orange red on wool is obtained from 4-hydroxynaphthalene-1-phenylketone-3-carboxylic acid and the diazo compd. of metanilic acid. Numerous examples are given of dyes formed from diazo compds. and carbonyl derivs. of aromatic compds. of 1-hydroxynaphthalene-4-carboxylic acid. Most of these dyes are of various shades of red but those from dianisidine are deep violet-blue or black.

**Azo dyes.** R. STRÜSSER. U. S. 1,457,235, May 29. Dyes are formed by combining equimol. proportions of 3 components 1 of which is the tetrazo deriv. of 4,4'-diaminodiphenyl-3,3'-dicarboxylic acid and the others of which contain either sulfonic or carboxylic groups, *e. g.*, methylphenylpyrazolone and 1-*p*-sulfophenyl-3-methyl-5-pyrazolone, methyl-2-naphthylamine and 1-*p*-carboxyphenyl-3-methyl-5-pyrazolone, phenyl-2-naphthylamine and methyl-2-naphthylamine-7-sulfonic acid, acetoacet-*o*-chloroanilide and 1-amino-8-hydroxynaphthalene-4-sulfonic acid, phenyl-2-naphthylamine and 1,8-aminonaphthol-4-sulfonic acid, phenyl-2-naphthylamine and 1-hydroxynaphthalene-5-sulfonic acid, acetoacet-*o*-chloroanilide and 1-phenyl-5-pyrazoline-3-carboxylic acid or acetoacetanilide and acetoacetanilid-*p*-carboxylic acid. These dyes generally produce reddish or violet shades on cotton and may be subjected to an after-treatment with CuSO<sub>4</sub> to obtain fast dyeings of somewhat altered shades.

2-Amino-3-chloroanthraquinone and dye produced from it. F. W. ATACK and

C. W. SOUTAR. U. S. 1,452,774, Apr. 24. 2-Amino-3-chloroanthraquinone is directly obtained by treating 2-aminoanthraquinone with Cl gas in glacial HOAc or PhNO<sub>2</sub> and when brominated in the presence of PhNO<sub>2</sub> and Na<sub>2</sub>CO<sub>3</sub> yields orange needles, m. 235°, of 2-amino-1-bromo-3-chloroanthraquinone. The latter when heated with acetates of Na and of Cu and PhNO<sub>2</sub> forms a dye which appears to be 3,3'-dichloroanthraquinone-1,2,2',1'-N-dihydroazine, which dyes cotton bright blue shades from a hyposulfite bath.

**Dyeing textiles.** H. E. VAN NESS. U. S. 1,456,344, May 22. A liquid dye prepn. is injected into a mass of yarn or other textile material to be dyed under pressure so as to cause penetration by the dye along the line on which it is injected before any substantial portion of the liquid has been absorbed into the pores of the material. The method may be used for "spotting yarn."

**Continuous dyeing of cotton cloth.** H. METCALFE. U. S. 1,457,741, June 5. A strip of cotton cloth is uniformly dyed by passing it from one end continuously through one main body of dye, then sprinkling it on the back with dye from another body of dye, then squeezing the cloth so that the dye will be driven through the cloth uniformly, treating it with fixing agents and washing. The method is suitable for use in chrome-dyeing cotton cloth.

**Aromatic organic mercury compounds.** A. KLAGES. U. S. 1,455,495, May 15. Tetrabromofluorescein dissolved with KOH or other alkali and slowly added to a boiling HgCl<sub>2</sub> soln. forms a red powder, nearly insol. in common org. solvents (except glacial HOAc, in which it is somewhat sol.) and sol. in alk. solns. The HgCl<sub>2</sub> is used in excess and the residue of HgCl<sub>2</sub> after the reaction is extd. with alc., acetone or other solvent. In a similar manner Hg derivs. may be formed from fluorescein, methylfluorescein, dibromofluorescein, tetraiodofluorescein, phenolphthalein, tetraiodophenolphthalein, hydroquinonephthalein, oxyhydroquinonephthalein, resorcinolsuccinein, cresorcinolsuccinein and resorcinolsaccharcin. Various of the resulting Hg derivs. produce yellow, blue and different red shades on silk. They may also be used as *antituberc* therapeutic agents.

**Weighting dyed silk.** C. VON DER SCHMALZ. U. S. 1,457,607, June 5. Dyed silk fabrics are treated with a sirupy liquid contg. tannic acid, *e. g.*, sumac ext., in order to weight the silk.

**Artificial silk.** I. KITSEE. U. S. 1,457,977, June 5. A viscous cuprammonium cellulose soln. is coagulated and spun into threads by devices which operate together as one unit and exclude air from the material at the different stages of the process.

**Artificial silk from corn-cob material.** N. E. DITMAN. U. S. 1,456,540, May 29. Cellulosic corn-cob material is dissolved with caustic alkali and CS<sub>2</sub> and the soln. is regenerated to constitute an artificial silk.

**Hollow textile fibers.** J. ROUSSET. Brit. 189,639, Nov. 15, 1921. Gas-filled fibers obtained, *e. g.*, by spinning a viscose or similar soln. contg. dissolved or admixed air, or contg. a chemical which forms gaseous bubbles within the fiber when the latter issues from the spinning machine or draw-plate, are submitted to treatment so that the air or other gas is removed from the fiber, the walls of which collapse one against the other. Thus, air may be removed by treatment with air-free water or with water under pressure. Other means such as the progressive action of vacuum or pressure may be employed. Cf. C. A. 16, 3763.

**Removing rust stains from fabrics.** A. C. SHAVER. U. S. 1,457,609, June 5. A mixt. of oil of gaultheria 1, oxalic acid 5 and H<sub>2</sub>O 94% is used for rust removal.

## 26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

**A guide for the testing and investigating of paint materials.** E. MAASS AND R. KEMPF. *Farben-Ztg.* 28, 1135-6(1923).—An outline to be followed in the testing of pigments, vehicles, and ready mixed paints.

**Opaque bases (for lakes and pigments).** ALBERT CHRIST. *Farben-Ztg.* 28, 1069(1923).—Considerable hiding power is imparted to inert bases such as BaSO<sub>4</sub>, by heating and then sudden chilling. General methods are described for making various lakes and "let-down" pigments. (The editor of *Farben-Ztg.* expresses his skepticism of the subject.)

**The ignition of chrome green.** ERICH RENKOWITZ. *Farben-Ztg.* 28, 1068-8(1923).—Chrome greens are very susceptible to ignition during grinding, but a co-pptd. green is far less so than when the dry chrome yellow and dry Prussian blue are ground together.

The ignition process was studied in a U-tube, one arm of which was filled with glass beads and the other with a 15-mm. layer of the chrome green; on top of the chrome green rested a wad of glass wool and in this was imbedded the bulb of a thermometer. The whole tube was immersed in an oil bath, and air was slowly drawn through. When the explosion temp. was reached, the rush of gases lifted the thermometer out of the ignited mass. Moist air favored ignition, so that air satd. at 35° was used. Prussian blue loses its adsorbed  $H_2O$  at 110° and at 135° begins to lose small quantities of CN gases until 195° is reached, when gas evolution increases to a max. at 226°. At 230° ignition takes place with rapid evolution of  $NH_3$ ,  $CO_2$  and N, and an increase in temp. to glowing. In dry air ignition does not take place until 258° is reached. One g. of Prussian blue held at 190° requires 10 min. to liberate enough CN gas to be detected by the Prussian blue color reaction. This loss occurs apparently without simultaneous loss of any of the 13 to 19%  $H_2O$  which forms part of the blue mol. In the absence of O, the mol. breaks up at 230° into  $H_2O$  and HCN, but without production of  $NH_3$ . Technical Prussian blue contains salts from incomplete washing during manuf. When these are removed, the blue ignites at the const. temp., 234°. The presence of unremoved  $KClO_4$  is often blamed for the ignition of Prussian blue, but admixt. of this salt to pure blue disproves the claim. Addn. of 1.5%  $FeSO_4 \cdot 7H_2O$  to pure blue reduces the ignition temp. to 227°. While blue alone ignites quietly, mixts. with chrome yellow ignite explosively.  $PbCrO_4$  loses its O only at 500°, so that explosion results from the temp. imparted by decompn. of the blue mol. Manufg. experience and lab. tests show that greens contg. 20% Prussian blue and 80%  $PbCrO_4$  are more explosive than those with a higher or lower blue content, because the amt. of O liberated is apparently the critical proportion. If only 4% blue is present, ignition does not take place. The presence of inert pigments reduces the danger of ignition. Properly dressed, light-wt. mill stones for grinding chrome greens reduce the fire risk. Mixts. of chrome yellow and Prussian blue ignite 6° lower than a pptd. green of the same compn. Addn. of 2% vaseline oil to the green pigment increases the ignition temp. beyond the danger point. Exptl. results are tabulated.

F. A. WERTZ

**Tetralin, a sensitive reagent for the manganese content of white mineral pigments.** A. LAUFFS. *Chem.-Ztg.* 47, 315 (1923).—The pink discoloration of enamels contg. tetralin thinners is ascribed by Andes to the presence of Mn driers in the form of small particles (C. A. 15, 764), but exhaustive tests show Mn in any form will cause a pink coloration with tetralin. Lithopone contg. 0.005% Mn as impurity, if moistened with tetralin, and then dried on a steam bath, shows an unmistakable pink color, which is not produced by other common paint thinners. Turpentine acts similarly but is extremely much less sensitive. The action is probably due to conversion of the Mn into a colloidal form of tremendous tinting strength.

F. A. WERTZ

**Marine borer paints.** H. A. GARDNER. Paint Manufs. Assoc. of U. S., *Circ.* No. 176, 207-19 (May 1923).—The protective action of antifouling paints against marine borers was studied by submerging wood slats treated with one coat of the paints in the harbor of Beaufort, N. C. (cf. C. A. 17, 1336). Inspection of more than 100 variously treated slats after exposure for 14 mos. showed that with the preps. made with Norfolk standard antifouling soln., very poor results were obtained. Most of these paints contained Hg compds. Cu compds., especially  $Cu_2O$ , powdered Cu, and Cu-picric acid salts gave far better results. These panels were relatively free from surface fouling and from attack by marine borers. Poor results were obtained with paints contg.  $Zn(CN)_2$ ,  $BaCO_3$ , benzoic acid, phenol, TNT, thymol, various quinine and strychnine compds., etc. Ester gum paints with Hg compds. and with  $Cu(CN)_2$  gave better results, than shellac paints contg. the same poisons. Coal tar, damar, red gum, and other paint vehicles had no advantage over shellac. Good results were obtained from a paint contg. a mixt. of Hg and Paris green. The tests did not always indicate a direct relation between barnacle resistance and prevention of teredo action. The prevention of fouling by barnacles and of destruction of the wood by teredo rests upon the destruction of the embryo in both instances. Biological data on borers are given. Illus.

F. A. WERTZ

**Microstructure of paint films.** H. L. MAXWELL. *Chem. Met. Eng.* 28, 850-3 (1923).—Paint films were prepd. on tin foil laid over glass. The foil was then removed by amalgamating with Hg, and the films were placed between blocks of paraffin, and cross sectioned for microscopic examn. The films of red lead paint applied immediately after mixing show some sepn. of pigment particles from vehicle. If the red lead paint is allowed to stand before prepn. of the film, no sepn. of pigment can be detected, owing to the greater viscosity of the paint, and the more rapid drying caused by the accelerating effect of the dissolved  $PbO$ . The no. of coats of white lead or zinc paints making



up a film cannot be detd. with the microscope, except by staining the section with mildly alk. methylene blue. Illus. with photomicrographs. F. A. WERTZ

"Veralufarbe" of the United Aluminium Works of A.-G.-Lautawerk. OSCAR LECHER. *Chem.-Zig.* 47, 382(1923).—"Veralufarbe," patented name for iron oxide color, is obtained from the alkali residue of bauxite by pptn., washing, drying and purifying to get material of great fineness, approaching that of natural ochre and better than other artificial iron oxide colors. Ignition loss is 15.75%; the compn. is  $\text{SiO}_2$  2.73,  $\text{Al}_2\text{O}_3$  40.58,  $\text{Fe}_2\text{O}_3$  20.77,  $\text{CaO}$  13.50,  $\text{MgO}$  0.45,  $\text{SO}_2$  0.11,  $\text{Na}_2\text{O}$  3.15%. It gives uniform, reddish brown color and is used with lime, glue, oil and lacquer as paint for buildings, railroad cars, wooden casks and metal protection. Tests for over two yrs. show little deterioration. Coarse products from purification are well suited for green and brown glass and for special heat-resistant glass. HOWARD E. BATSFORD

A sealing compound for volatile thinner storage tanks. H. A. GARDNER. Paint Manufs. Assoc. of U. S., *Circ.* No. 179, 238-40(May 1923).—Tests on a sealing compd., prepd. from glucose, starch, glycerol,  $\text{CaCl}_2$ , and glue beaten into a frothy mass, showed that it spreads out in an even layer over volatile thinners and prevents evapn. and eliminates fire hazards. Illus. F. A. WERTZ

Cashew-nut oil. H. A. GARDNER. Paint Manufs. Assoc. of U. S., *Circ.* No. 180, 241-4(May 1923).—Cashew nuts, *Anacardium occidentale* L., from Portuguese East Africa contained 20% of oil, I no. (Hanus) 158,  $n_{19.5}$  1.5153. The raw oil did not show much indication of drying, and when brushed on a varnished panel acted like a paint and varnish-remover in softening the old film. This action is probably due to oil from the outer shell of the nut, which contains substances resembling in their action crude carboic acid. Illus. Consular report is given. F. A. WERTZ

The Chinese drying oils. I. C. T. WANG. *J. China Soc. Chem. Ind.* 1, 11-30 (1923).—Tung oil and perilla oil are the important drying oils of China. Perilla oil was used in China in ancient times, but had been largely superseded by tung oil. The drying qualities of perilla oil are superior and this industry should be revived in China. Wm. H. ADOLPH

Oticia oil. H. A. GARDNER. Paint Manufs. Assoc. of U. S., *Circ.* No. 177, 220-6(April 1923).—Oticia nuts showed 50% oil of acid value 45.3; I no. (Wijs) 123; sapon. no. 203.2;  $n$  1.49. The oil dried to a frosty film; it bodied rapidly on heating, but did not produce a gel, probably on account of its high acidity. Some previous results on oticia oil are reviewed (cf. C. A. 12, 2056). The oil would no doubt be of value to the paint and varnish trade, but a marketable supply does not appear available. F. A. WERTZ

The chemistry of rosin and rosin oil. C. E. SOANE. *J. Oil and Colour Chemists' Assoc.* 5, 320-47(1922).—A critical review of the work done on rosin and rosin oils with bibliography and discussion. It is now generally agreed that all resin acids contain a hydrogenized retene nucleus (see C. A. 15, 862); the position of the side groups is still in dispute, but it is safe to assume that the relative positions of the  $\text{CH}_3$  and isopropyl side chains may account for the isomerism in the resin acids. Rosin oils consist of hydrocarbons of the hydrogenized retene type, together with decompn. products approaching a benzenoid character. The estn. of mineral oil in rosin oil may be based on the former's lower d. and  $n$  and lesser soly. in alc.,  $\text{Me}_2\text{CO}$ ,  $\text{AcOH}$ , epichlorohydrin, etc. The detn. of mineral oil by oxidation of the rosin oil with  $\text{HNO}_3$  is not very satisfactory. If  $n$  of the unpolymerized residue obtained on treatment of the oil with concd.  $\text{H}_2\text{SO}_4$  in the cold is below 1.53, mineral oil is present. Graphic structural formulas and a table of characteristics attributed to rosin, rosin oil and related hydrocarbons are given. Discussion brought out that *rosin in soap* can be detd. accurately by dissolving 2 g. of mixed acids from the soap in 50 cc. petr. ether, and then shaking with 10 cc.  $\text{HNO}_3$  (d. 1.5); the acid layer is run off and the treatment repeated until no further discoloration occurs. The ether layer is washed and evapd., and the residue consists of fatty acids; and the difference in wt. constitutes the rosin. F. A. WERTZ

Changes in powdered rosin stored in closed containers. F. P. VETICH AND W. F. STERLING. *Ind. Eng. Chem.* 15, 576-7(1923).—Rosin powdered and stored in partly filled closed containers suffers appreciable changes in phys. and chem. consts. within a few days; tabulated results on a number of samples that have been kept for 6 wks. showed the following changes: decrease of from 5.3 to 9.3 in acid no.; increase of from 5.1 to 8.9 in sapon. no.; decrease of from 47.3 to 52.2 in I no.; increase of from 8.9 to 11.3 in m. p. The rate of change slows down after the first week, and after the third week, only the I no. and m. p. continue to change appreciably. F. A. WERTZ

Turpentine and rosin. Distribution of the world's production, trade and consumption. V. E. GROTLISCH. U. S. Dept. Agr., *Circ.* 258, 1-13(1923).—Statistical. W. H. ROSS

**The varnish industry and furfural resins.** G. MRUNIER. *Rev. chim. ind.* **32**, 103-6(1923).—A discussion of the various types of furfural resins and of the possibility of prepg. them on a com. scale from cellulosic materials. A. PAPINEAU-COUTURE

**The German varnish industry.** K. H. ALBRECHT. *Farben-Ztg.* **28**, 855-6, 929-30 1064-5, 1134-5(1923).—A presentation of the economic development of the industry.

F. A. WERTZ  
**Enamel varnishes and their substitutes.** G. BERGMANN. *Lack-u. Farb. Rundsch.* **1921**, No. 9, 199-200; *Chimie et industrie* **9**, 766(1923).—A review of the advantages of enamel varnishes and of the precautions to be taken in their manuf. A. P.-C.

**Varnish resins.** F. L. MEYER. *Drugs, Oils & Paints* **38**, 349-52(1923).—A review of the source, designation, characteristics, and uses of varnish resins. F. A. W.

**Rendering resins soluble.** CH. COFFIGNIER. *Rev. chim. ind.* **32**, 83-4(1923).—  
Polemical against de Kegel. Cf. *C. A.* **17**, 2057. A. PAPINEAU-COUTURE

Color designation, color measurement, fading and its measurement (TRILLICH) (BAWREER) (LANG) (LOWRY, MCHATTON) (HARMER) **2**. Deflocculating and reflocculating clay or other materials [for use as a pigment] (U. S. pat. 1,456,112) **19**.

**Lithopone.** NEW JERSEY ZINC CO. Brit. 189,523, Aug. 30, 1921. Lithopone, characterized by high light resistance, low oil absorption and good covering power, is made by mixing solns. of BaS and ZnSO<sub>4</sub> in the presence of a small and adjustable amt. of a sol. chloride, H<sub>2</sub>SO<sub>4</sub>, or other appropriate electrolyte, and muffling the product at a temp. between 650° and 800°, depending on and varying inversely with the amt. of electrolyte used. H<sub>2</sub>SO<sub>4</sub> of 60° Bé. in amts. less than 0.1% of the combined pptg. liquors, calcd. as 60° Bé. ZnSO<sub>4</sub> soln. and 12° Bé. BaS soln., or the equiv. of 0.1-2 g. of Cl per l. of 20° Bé., ZnSO<sub>4</sub> is preferred. Muffling is preferably carried out in a vertical retort, through which the lithopone is continuously passed by gravity, and the product is then plunged into H<sub>2</sub>O, ground, pressed and disintegrated. The lithopone has an HOAc sol. Zn content of less than 1% and is free from grit.

**Lithopone.** NEW JERSEY ZINC CO. Brit. 189,524, Aug. 30, 1921. Lithopone is passed by gravity through a vertical retort of metal or other good heat-conducting material, and preferably about 10 in. in diam. and 25-30 ft. long. The lithopone, contg. as much as 10% of moisture, is fed into the retort from a hopper and travels down in 5-10 hr., being subjected to a muffling temp. of 550-800°. The muffled product is periodically discharged into a vessel contg. cold H<sub>2</sub>O, by a device, such as a star-wheel, intermittingly rotated by mutilated gearing. During the operation, the lithopone is surrounded by a non-oxidizing atm., composed mainly of hot steam, which serves to dry the incoming material.

**Lithopone.** NEW JERSEY ZINC CO. Brit. 189,525, Aug. 30, 1921. An app. for uniformly heating or muffling lithopone comprises a vertically disposed and externally heated retort, or bank of retorts, through which the lithopone is passed under gravity. A suitable construction is specified.

**Lithopone.** W. F. MRISTER. U. S. 1,455,963, May 22. A small percentage (preferably about 0.5-5%) of ZnSO<sub>4</sub> is added to com. lithopone to render it sun-proof.

**Polish for varnished surfaces.** F. F. KUHN. U. S. 1,457,080, May 29. Turpentine 6, paraffin oil 57, boiled linseed oil 22, 10% NH<sub>3</sub> soln. 10, vinegar 32 and ether 0.25 oz.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

**A method of analysis of cacao butter, and of its mixtures with vegetable butters.** MARCEL PICHARD. *Compt. rend.* **176**, 1224-6(1923).—The general property possessed by fats of having a characteristic min. temp. at the end of supercooling and the beginning of solidification is utilized to detect adulterant fats in cacao butter. By plotting the temp. of a fused fat as a function of time, various fats are shown to have distinctly different curves. Cacao butter from various sources gave the same curve, so that this fat could be distinguished from all others. Mixts. of cacao butter and any other vegetable fat gave a curve different from the curves of the component fats, offering a ready means of detecting adulterants. C. C. DAVIS

**Oil from *Sterculia* species.** C. D. V. GEORGI. *Malayan Agr. J.* **10**, 259-61 (1922).—Distinct oils were extd. with Et<sub>2</sub>O from the pericarp and kernels of seeds of a species of *Sterculia* in yields of 26.9 and 28.9%, resp. The const. of the pulp and

kernel oils were, resp.: dark brown semi-solid m. 30° with earthy odor, dark green fat with sweet odor m. 35°;  $d_{40}^{20}$ , 0.8560, 0.8676;  $n_{40}$  1.4578, 1.4820; sapon. no. 191.2, 190.2; I no. 69.7, 62.3; acidity 74.2, 10.6; unsaponifiable 3.7%, 5.6%. Their fatty acids had: m. p. 30-1°, 50.3°; I no. 71.7, 63.3; mean mol. wt. 298.9, 325.2. The high acidities are ascribed to previous moist storage.

C. C. DAVIS

**Kapok oil.** C. D. V. GEORGI. *Malayan Agr. J.* 10, 284-6(1922).—By  $\text{CHCl}_3$  extn. of kapok seeds, over 20% of a clear, pale yellow, sweet smelling oil was obtained, which on standing deposited stearin. The consts. were:  $d_{25.5}^{20}$  0.918,  $n_{25}$  1.4710, sapon. no. 191.0, I no. 94.3, acidity 1.8%, unsaponifiable 0.8%. The fatty acids had: m. p. 28.4°, mean mol. wt. 284.3, I no. 94.2. The cake remaining after extn. contained 3.98% N.

C. C. DAVIS

**Cashew nut oil.** C. D. V. GEORGI. *Malayan Agr. J.* 10, 301-2(1922).—The kernels contained 40-5% oil, but high pressure was necessary for extn. and decortication was difficult because of the leathery shell and vesicant liquid. The consts. of the oil were:  $d_{25.5}^{20}$  0.919,  $n_{25}$  1.4770, sapon. no. 187.3, I no. 78.4, acidity 5.5%, unsaponifiable 0.6%. The fatty acids had: m. p. 28°, mean mol. wt. 284.6. The cake remaining after expression had 23.4% albuminoids.

C. C. DAVIS

**Malayan vegetable oils and fats of minor importance.** C. D. V. GEORGI. *Malayan Agr. J.* 10, 222-7(1922).—Brazil-nut oil (*Bertholletia excelsa*), calophyllum oil (*Calophyllum inophyllum*), croton oil (*Croton tiglium*), pulasan fat (*Nephelium mutabile*) and rambutan fat (*Nephelium lappaceum*) are considered. The consts. of all of these except pulasan fat agreed with those given by Lewkowitsch. The consts. found for it were:  $d_{25}^{20}$  0.8597,  $n_{20}$  1.4579, sapon. no. 199.0, I no. 41.6, solidifying point of fatty acids 50.9°. These agree with those for rambutan fat.

E. SCHERUBEL

**Acidity of vegetable oils.** N. REUMEAUX. *Mat. grasses* 15, 6414-5(1923).—Acidity is generally conventionally expressed in terms of oleic acid, but should be calcd. from the mean mol. wt. of the acids of the oil analyzed.

A. PAPINRAU-COUTURE

**Soy-bean oil.** M. NAKAO AND S. IKEBE. *Far Eastern Rev.* 18, 180-5(1922).—Of 214 varieties of Manchurian soy bean, the yellow varieties show the highest oil content. Bean oil manufd. in Manchuria seldom meets the severe color standard for import into U. S. A. Iron containers are most objectionable in preserving the oil. To prevent the increase of free fatty acid, the oil should be kept in the dark and away from contact with moist air.

WM. H. ADOLPH

**Soy-bean industries.** I. T. WONG. *J. China Soc. Chem. Ind.* 1, 83-92(1923).—Methods of prepn. and analyses are given for 9 products manufactured from soy bean, including oil, bean curd, bean milk, etc. A coffee substitute is made by digesting the beans in lime water, roasting the resulting material, and adding sugar after powdering.

WM. H. ADOLPH

**The utilization of the residues of oil extraction from olives.** R. DE MANTARRÉS. *Rev. vinicola agricultura* 41, No. 4, 39-40(1922); *Bull. Agr. Intelligence* 13, 588-9.—The following distn. products were obtained: charcoal,  $\text{AcOH}$ , alc. and  $\text{NH}_3$ .

H. G.

**Apparatus for extracting oily matter by trichloroethane.** J. BONNET. *Bull. trimestriel office régional agr. Midi*, No. 1, 11-23(January, 1922); *Bull. Agr. Intelligence* 13, 749.—B. uses non-inflammable, incombustible and inexplosive  $\text{MeCCl}_3$ . As it is sensitive to light it should always be stored in metal receptacles underground, care being taken to cover it with a layer of water 0.25 m. to 0.40 m. to prevent evapn. Extn. requires 2-3 hrs. The solvent is recovered by steam distn.

H. G.

**Discoveries in the field of glycerol distillation.** R. HEINZELMANN. *Apparatebau* 34, 97-9, 113-4.

H. G.

**The determination of the acet value.** J. R. POWELL. *Ind. Eng. Chem.* 15, 622(1923).—The acetyl value of oils could not be accurately detd. by the method of the Assoc. Official Agr. Chemists (cf. *Methods* 1920, 250), but by the André-Cook method (cf. *C. A.* 16, 1674) uniform results were obtained.

C. C. DAVIS

**Distillation and purification of fatty acids.** R. HEINZELMANN. *Apparatebau* 34, 209-4.

H. G.

**The detergent action of soap.** R. F. A. MEES. *Chem. Weekblad* 20, 302-4(1923).—The products of dissociation formed in aq. soap solns. are not essential for the lowering of the interfacial tension of water and oil. It is more likely that the soap mol., as such, is essential in this regard according to its heteropolar character, being formed of water-sol. alkali and fat-sol. fatty acid. The soap mol. seems, therefore, especially fit for a directed soly. according to the theory of Langmuir. Only soap is capable of stabilizing oil-in-water suspensions, while fatty acids can only stabilize water-in-oil emulsions.

R. BRUTNER

**Artificial cooling of soap.** A. BOLIS. *Industr. saponiera* 21, 409-10(1922); *Chimie*

*et industrie* 9, 762-3(1923).—A description of various types of app. for artificial cooling of soap and of their merits. A. PAPINNAU-COUTURE

The fat content of foods and soaps (MONHAUPT) 12. Kapok (GRIST) 25. Sunflower growing in Rhodesia (MADNWARING) 12. Cultivation of the opium poppy in Bulgaria and Macedonia (NIKOLOFF) 17.

**Refining vegetable oils.** C. H. HAPGOOD and G. F. MAYNO. U. S. 1,457,072, May 29. Cottonseed oil or other vegetable oil is filtered to remove coarse solid particles, heated to 27-36° and treated with a flowing stream of a saponifying agent such as NaOH soln. with which the oil is agitated to effect a primary sapon. of the fatty acids. The resulting mixt. is centrifuged to effect sepn. of saponifying agent and soaps from the oil after a brief intimate mixt. and secondary sapon. The sepd. oil is agitated with an inert clarifying agent such as fuller's earth and is then filtered.

**Preserving whale and other animal carcasses.** K. TH. FOSHEIM and EINAR KOLLE. Norw. 36,340, Dec. 4, 1922. Putrefaction is avoided by introducing antiseptics into the entrails.

**Odorless and tasteless liquid oils from fish oils.** DE NORDISKE FABRIKKER DE-NO-FA, A/S. Norw. 34,401, March 20, 1922. The oil is slightly hydrogenated under application of small amts. of catalyzer, and is then slightly polymerized by addn. of H in closed vessels, cooled in H-atm. and finally completely deodorized by vapor.

**Clarifying fish oil.** ALFRED ANDERSEN. Norw. 35,890, Oct. 9, 1922. The oil is kept in const. motion in a cooling vessel the walls of which are surrounded by a cooling body, and which may also have cooling bodies within them.

**Extracting fish oil.** H. A. WENTWORTH. U. S. 1,456,019, May 22. Fish material 25 gal. is heated to the b. p. with live steam and, after shutting off the steam, is treated with a mixt. of 10 lbs. of 76% NaOH in 3 gals. H<sub>2</sub>O and then with 1 gal. of 60° H<sub>2</sub>SO<sub>4</sub>, which is slowly added while stirring, and, after allowing the treated material to stand, the oil is removed.

**Purification of fatty acids from fish oils, etc.** TAIJI OHASHI and THE NIPPON GLYCERINE KŌGYŌ KABUSHIKI KAISHA. Japan. 41,325, Dec. 27, 1921. Fatty acids (100 parts), obtained from fish oils, sea animal oils, etc., by hydrolysis, are heated at about 80°, and 1-2 parts of 30% NaHSO<sub>4</sub> soln. are added and then 20-40 parts of H<sub>2</sub>SO<sub>4</sub> of B.é. 65-66° are gradually added. The mixt. is then heated at 100-130° for 10 hrs. under agitation. The acid is sepd. from waste acid liquor, washed with Ca(OH)<sub>2</sub> soln. and warm H<sub>2</sub>O and fractionally distd. under reduced pressure into stearic acid, oleic acid, etc. The product is free from disagreeable odor and has high m. p. Loss in the process is small.

**Press for herring oil.** OLA HOFF. Norw. 34,098, Feb. 6, 1922. The materials are pressed continuously down through a vertical shaft with constantly decreasing cross-sectional area, whereby the pressure increases in the same ratio.

**Nickel catalyst.** A. GRANICHSTADTEN and E. SITTIG. U. S. 1,450,174, Apr. 3. A catalyst adapted for hydrogenating oils is prepd. by adding an aq. soln. of Na silicate to an aq. soln. contg. salts of Ni and Mg, e. g., NiCl<sub>2</sub> and MgCl<sub>2</sub>, to ppt. a double colloidal silicate, washing, drying and grinding the ppt. and reducing and cooling in H.

**Catalyst for use in hydrogenation.** J. P. HARRIS. U. S. 1,457,835, June 5. A catalyst is prepd. by grinding a mixt. of a fatty acid salt of a catalytic metal, e. g., Ni acetate, with an inert comminuting material such as infusorial earth and then heating the product with oil.

**Bleaching earths.** C. CRAMER. U. S. 1,455,995, May 22. "Bleaching earths" having a high bleaching effect and adapted for use with oils or fats are prepd. by treating Al hydrosilicates such as fuller's earth with dil. HCl and emulsifying the resulting mixt. intensely while cold.

**Composition for cleaning aluminium.** C. M. HEMEN. U. S. 1,456,486, May 22. A detergent for Al is formed of white castile soap 1 lb., oxalic acid 1 oz., ZnO 1 oz., NaHCO<sub>3</sub> 1 oz., gum tragacanth 0.25 oz., soft H<sub>2</sub>O 6 qts. and a fine abrasive, e. g., pumice.

**Treating clay.** E. G. ACHESON. U. S. 1,456,111, May 22. Clay freed from grit is subjected to attrition with methylene-amines or other deflocculating agent to transform a portion of the material into colloidal condition and the colloidal particles are then pptd. in the presence of residual fine material, by alum, NaCl or other electrolyte to obtain a product which is suitable for use in soap compns.

## 28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

**Cultural demands of the different cane varieties in Java.** J. M. GEERTS. *Arch. Suikerind.* 31, 323-36(1923).—A comprehensive discussion is presented of the factors which det. the practical value of the principal cane varieties for different localities and conditions in Java.

F. W. ZERBAN

**Statistics of the distribution and yield of cane varieties in the season of 1920.** J. VAN HARREVELD. *Arch. Suikerind.*; *Mededeel. Proefstat. Java-Suikerind.* 1923, 17-94; cf. C. A. 15, 1417; 17, 1728.—Complete data are presented for 173 out of 183 factories. Variety EK 28 now occupies first place in point of acreage (31.5%), and is followed by 247 B (26.5%), DI 52 (13.75%) and 100 POJ (10%). EK 28 also gave the highest yield of sugar per acre, with DI 52, 100 POJ, and 247 B following in regular order.

F. W. ZERBAN

**Sugar production in the season of 1922 (in Java).** J. VAN HARREVELD. *Arch. Suikerind.* 31, 237-49(1923).—Complete statistics are given, in the form of tables, of quantities of cane ground, and of the different grades of sugar, molasses and hard molasses produced by each of the 182 factories; also comparative data for the yrs. 1910-22.

F. W. ZERBAN

**Compounds between sugars and salts.** I. M. KOLTHOFF. *Arch. Suikerind.* 31, 261-9(1923).—Helderman's assertion (C. A. 15, 3221, 4056) that the existence of sugar-salt compds. has not been proven is untenable on theoretical grounds, and even if they could not be isolated this would not mean that they did not exist in soln. As a matter of fact, K. has prep'd. at 18° a stable compd. of sucrose and NaCl; H. did not wait long enough for the compd. to form.

F. W. Z.

**Sugar-salt compounds.** W. D. HELDERMAN. *Arch. Suikerind.* 31, 269-71(1923).—Reply to Kolthoff (cf. preceding abstr.). H. never claimed that such compds. did not exist, but only that in Java molasses at 30° they did not form a stable phase in equil. with their sat'd. soln. Even their isolation from systems held at 18° does not disprove H.'s molasses theory. The latter will stand unless it can be proven that sugar-salt compds. exist at 30° in equil. with their sat'd. soln.

F. W. ZERBAN

**The question of "recovery"; its place in determining the economy of sugar manufacturing processes.** G. S. CLARKE. *Facts About Sugar* 16, 431(1923).—While much attention is paid to obtaining high juice extn., C. thinks the question of recovery of sucrose available in the juice is too much ignored. Many empirical mfg. methods need strict scientific supervision. Refining with active vegetable carbons is especially recommended. Various points for investigation are noted.

T. SWANN HARDING

**Better raw sugars needed.** B. SANDMANN. *Facts About Sugar* 16, 274(1923).—Most tropical raw-sugar houses over-lime their mud settlings and over-process their low products. Neutral clarification is advocated for sugar destined to go into direct consumption and acid clarification when refined sugar is to be the end product. Acids forming insol. lime salts are ppt'd. at once; weaker acids with negligible inverting power are best left unneutralized.

T. SWANN HARDING

**Carboraffin in refinery operation.** HAMSON LUSTIG. *Z. Zuckerind. czechoslovak. Rep.* 47, 316-8(1923).—First refinery sirups were decolorized with carboraffin exclusively in the campaigns of 1921-2 and 1922-3. 2450 D. (65,000 gal.) of sirup of 60° Bx. were handled in 24 hrs. in 12 Danek filters with alternate leaves omitted, giving a total of 23 sq. m. (246 sq. ft.) filtering surface. 60-65 kg. carboraffin are mixed in 5 D. boiling H<sub>2</sub>O, made faintly alkaline with CaO, 8 D. filtered sirup added, and the mixt. is run to the filters. Sirup to be clarified follows at once, at 80-85°. The filters run water-white for 3-4 hours, show 1° St. color after 12 hrs., and 1.5-2.2° (per 100 sugar) after 24 hrs. The filter is opened, the carboraffin pumped to a tank, the cloths are washed, and the same mass is re-used. The 2nd time the color reaches 1.5° after 12 hrs. and 2.2° after 24 hrs. The carboraffin is then re-used another time. One filter per 12 hrs. is filled with new material, this being 0.071% of the raw sugar worked. By using 3 filters with 43 kg. carboraffin each instead of 2 with 65 kg. an increase in capacity was obtained. All products were fully up to standard. Carboraffin is much simpler and cheaper to use than bone black and gives less diln. from wash water.

W. L. BADGER

**Hydrogen-ion determination as a method of refinery control.** H. Z. E. PERKINS. *Ind. Eng. Chem.* 15, 623-4(1923).—High grade refinery liquors of light color, above 80 purity and with little ash, are best tested by the indicator method, while low grade dark materials with greater quantities of electrolytes can be measured better with the

potentiometer. Generally the  $p_H$  is highest in the high purity products which are quite stable, and low in the low purity products which ferment readily, with a corresponding decrease in the  $p_H$ . High purity, defecated sugar liquors have a  $p_H$  of 6.4–6.8, and they may reach 7.0 after char filtration. Their  $p_H$  should not fall below 6.2, although sirups for soft sugars, of 90–3 purity, sometimes show  $p_H$  6, and a tendency to sour. Green wash sirups have a  $p_H$  of 3.6–4.0, and are defecated to  $p_H$  5.0 to 6.0. Sometimes coagulation of colloids in these sirups is difficult, even at a higher  $p_H$ ; bone black filtration increases the  $p_H$  about 0.5 points. The  $p_H$  of concd. sweet water is 4.8–5.0, after defecation 5.0–5.8, and after char filtration 5.4–6.0.

F. W. ZERBAN

**The Steffens press diffusion with continuous leaching of the chips in the "Rapid" apparatus.** FRANZ HERZFELD. *Centr. Zuckerind.* 31, 506(1923).—The high sugar content of chips from the Steffen's diffusion process is a disadvantage when there is a poor market for stock food. In a factory using this process but having no diffusion battery, the chips from the Steffen's process were pressed to 26% solids, mixed with press water, and fed to a shortened "Rapid" app. The results of a 2 weeks test were entirely satisfactory.

W. L. BADGER

**Perforated trash plates.** J. G. VAN HAM. *Arch. Suikerind.* 31, 271–3(1923).—To utilize, for the extn. of juice, the pressure exerted on the cane while being moved over the trash plate, 0.5 in. perforations were cut obliquely through the plate, 2.5 in. apart; the holes were inspected after having been in use for some time. The holes in the plate of the first mill were still fully open and functioning; in the second mill they were partly filled, but still allowed juice to pass; in the third they were found stopped up. It is recommended to try the device in other places. It pays to have the opening between the rollers correctly adjusted, as this increases the sugar extn. without lowering the fuel value of the bagasse, because the latter is drier.

F. W. ZERBAN

**Steam in the sugar factory.** L. GIRAUD. *Rev. agr. Maurice* 1, No. 7, 19–21(1923).—A brief general discussion.

F. W. Z.

**Narrowing vs. widening steam coils.** J. G. VAN HAM. *Arch. Suikerind.* 31, 285–6(1923).—Coils in which the steam enters into the narrowest turn heat the contents of a tank more quickly than those where it enters into the widest turn. The former system also shows less tendency to knock, and is more economical for heating tanks and pans in sugar factories, because a shorter coil can be used, with the same result.

F. W. ZERBAN

**Manufacture of lactose.** CH. GROUND. *Lacta* 3, 10–3(Aug. 1922).—A description of the com. manuf. of lactose.

A. PAPINEAU-COUTURE

**Determination of starch content in the presence of interfering polysaccharides.** G. P. WALTON AND M. R. COB. *J. Agr. Research* 23, 995–1006(1923).—The material is extd. with  $\text{Et}_2\text{O}$ ,  $\text{C}_2\text{H}_5\text{OH}$  of 25 to 35% strength, strong  $\text{C}_2\text{H}_5\text{OH}$  and finally with  $\text{Et}_2\text{O}$  to eliminate interfering sol. substances. The material is then digested with an infusion of barley malt, the interfering polysaccharides are pptd. by 60%  $\text{C}_2\text{H}_5\text{OH}$ , the  $\text{C}_2\text{H}_5\text{OH}$  is evapd. from the filtrate and the starch conversion products are subjected to acid hydrolysis, the resulting dextrose soln. is treated with phosphotungstic acid and the dextrose detd. by Cu reduction. From 97.2 to 99.9% of the starch added to linseed meal of known purity was detd. by this procedure.

F. C. COOK

**Estimation of starches by means of the weight of the grains.** L. LINDET AND P. NOTTIN. *Ann. fals.* 16, 134–7(1923).—Starch is suspended in water (letting stand 1–2 hrs. if it was originally dry), violently agitated while slowly inserting a capillary tube which is closed with the finger when it reaches the bottom. The contents of the tube are placed on a microscope slide, the diameters of 150–200 grains are measured and averaged, and the wt. per million grains is  $3.26 R^3 \times 10^4$ . The method of deducing the formula is given in detail. The method is delicate and accurate and would be useful for grading starches, and possibly for works control in starch factories.

A. PAPINEAU-COUTURE

**Soluble starch or amyloextrin.** A. REYCHLER. *Bull. soc. chim. Belg.* 32, 221–7(1923).—Sol. starch is prepd. by treating 100 parts of starch with 130 cc. 0.25 N HCl contg. 0.75%  $\text{K}_2\text{Cr}_2\text{O}_7$ . The product obtained dissolves clearly in water to which a trace of alkali is added.

R. BEUTNER

Effect of sugar on cement mortar (DAUTREBANDE) 20. Action of sugar juices on concrete (OCHS) 20. Composition of filter press cake (SHERWOOD) 15. Fertilizer experiments on cane (SORNAV) 15.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**Researches on leather.** M. AUERBACH. *Z. Leder- u. Gerberei-Chem.* 1, 227-31 (1921-2).—Stuffed and unstuffed leathers treated with dil.  $H_2SO_4$  and dried at  $50^\circ$  for 4 hrs. are not much affected. Pelt swollen in dil.  $H_2SO_4$  and tanned with acid solns. of quebracho loses strength when dried. Pelts tanned with partially sulfited quebracho exts. do not diminish in strength when dried at  $50^\circ$ . Pelts swollen in dil.  $H_2SO_4$  and tanned with neradol and partially sulfited quebracho exts. yield leathers which are not affected in strength by drying at  $50^\circ$  or  $80^\circ$ . J. S. C. I.

**Neutralization and fat liquoring of chrome leather.** PAUL CHAMBEARD. *Cuir* 12, 160-1 (1923).—An address, in which the author discusses the effect of the acidity of the bath upon the rate of tannage and the quality of the product; depickling agents; neutralization and the specific effects of different neutralizing substances; and the influence of the basicity of the leather upon the fat liquoring process. H. B. M.

**Analysis of chrome-tanned leather.** ERNEST LITTLE AND ELMER SARGENT. *Ind. Eng. Chem.* 15, 633 (1923).—A modification of the  $Na_2O_2$  method for detg. chrome in leather. In the presence of Ba low chrome figures result from loss of  $BaCrO_4$  during filtration in removing the  $Fe(OH)_3$ . The addition of  $NH_4F$  to the soln. eliminates this loss, and filtration of soln. is avoided. The  $NH_4F$  modification of the peroxide method is more accurate and requires less time than the borax method. ERWIN J. KERN

**The extraction of water-soluble from leather.** G. W. SCHULTZ. *J. Am. Leather Chem. Assoc.* 18, 254-62 (1923); cf. C. A. 16, 2040.—Water-sol. matter is extd. from leather at increasing rate with higher temp. up to  $50^\circ$ . It is suggested that the amt. of water-sol. matter in leather be taken as that extractable from 30 g. of leather by 2 l. of water at  $4^\circ$ . J. A. WILSON

**The determination of the sugar content of leather—committee report for 1923.** R. W. FREY, I. D. CLARKE, et al. *J. Am. Leather Chem. Assoc.* 18, 262-84 (1923).—A continuation of earlier work (cf. C. A. 16, 2618). J. A. WILSON

**Substances used in leather finishing.** G. GRASSER. *Cuir* 12, 121-3 (1923).—A description of the oils, etc., commonly employed. H. B. MERRILL

**Preservation of vegetable leather.** F. REV. *Cuir* 12, 162-4 (1923).—Leather in storage requires regreasing after a time, owing to "a more complete combination of the grease with the fibers." Methods of accomplishing this and for greasing shoes are described. H. B. MERRILL

**Leather dressing and preserving agents.** MAURICE DE KEGHEL. *Cuir* 11, 519-20 (1922); 12, 21-3, 41-3, 166-70, 190-2, 208-10, 234-6 (1923).—A collection of receipts. H. B. MERRILL

**The action of trypsin on collagen and the influence of neutral salts upon this action.** E. STIASNY AND W. ACKERMANN. *Kolloidchem. Beihefte* 17, 219-55 (1923); *Collegium* 1923, 33-43, 74-93.—The action of trypsin on collagen depends on the previous history of the collagen as well as upon its degree of swelling. This explains the discordant results reported. Neutral salts were added to hide powder or pelt in the presence of trypsin and the  $\eta_{sp}$  (electrometrically) and swelling measured. KCNS, KI,  $KNO_3$  and KCl showed swelling effects in 0.01-0.1  $N$  solns., a sharp max. in  $N$  and a distinct arrest of swelling in 3  $N$  to 5  $N$  solns.  $K_2SO_4$  showed a swelling max. in 0.1  $N$  soln. The degrees of swelling were greater at  $37^\circ$  than at  $20^\circ$ . The  $p_H$  was maintained at 8.6 in these swelling systems, the swelling maxima for each anion were arranged and the Hofmeister series was confirmed. This is contrary to the findings of Loeb who denies the existence of such a series at const.  $p_H$ . Swelling is associated with peptization by these salts and the greater the swelling the greater is the peptizing effect. The proteolytic and peptolytic actions of trypsin on hide powder in the presence of neutral salts were measured at  $30^\circ$  and  $37^\circ$  for comparable series after 2 hrs., 1 and 6 days by detns. of swelling formol titrations of aliquot parts of the hide powder filtrate, pptn. of tanning matter and total N. Varying concns. of KCNS in this series showed that 0.01  $N$  and 0.1  $N$  solns. affect appreciably the proteolytic and peptolytic actions of trypsin, that  $N$  solns. affect markedly the proteolytic action of pancreas trypsinase but definitely diminish the peptolytic action of pancreas peptase and that 5  $N$  solns. accentuate both peptolytic and proteolytic effects. This proteolytic effect of KCNS on trypsin runs parallel to that of swelling. Increase of trypsin concn. or temp. accelerates the trypsin effect proportionately without altering any the relationship between the swelling and the proteolytic trypsin effect. Similar studies were carried out with KI,  $KClO_3$ ,  $KNO_3$ , KCl and  $K_2SO_4$ . The salt effect on the substrate must be differentiated from that on the

enzyme. The salts with max. swelling effects influence the substrate to a greater extent. Swelling effects run parallel to trypsin effects. In some cases ( $\text{KNO}_3$  and  $\text{KCl}$ ) high salt concns. appear to affect the enzyme more than the substrate, for 4 *N* solns. of these salts diminish the swelling but not the proteolytic trypsin effect which does not attain a maximum even with *N* solns. The salt effect on the enzyme is marked in peptolytic trypsin activity. The independence of peptolytic from proteolytic action is especially evident with *N* solns. of  $\text{KCNS}$  and  $\text{KI}$  which accelerate the proteolytic trypsin effect and retard the peptolytic action. Hide powder is more sensitive to trypsin than pelt not only because of the tremendous surface of powdered particles but also because of the modification of the surface layers as a result of prepn. and friction heat in grinding. The trypsin effect on pelts in high salt concns. is decidedly destructive.

I. NEWTON KUGELMASS

**Hydrolysis of collagen by trypsin.** A. W. THOMAS AND F. L. SEYMOUR-JONES. *J. Am. Chem. Soc.* 45, 1515-22 (1923).—A study has been made of the hydrolysis of collagen with trypsin by controlling the acidity of the pre-treatment and digestion and exang. the effects of varying the time of digestion, concn. of enzyme and size of the collagen particles. The extent of digestion was detd. by measuring the decrease in vol. of the centrifuged hide powder. The optimum H ion concn. for the hydrolysis is  $\text{pH}$  5.9. Pretreatment of the collagen in solns. of various degrees of acidity does not influence the subsequent digestion. The speed of hydrolysis increases with increasing fineness of the particles, the action probably taking place at the surface of the latter. Hydrolysis increases with increasing concn. of the trypsin but never reaches completion under the limits of exptl. conditions. The reversibility of the reaction is discussed and the similarity of the action of trypsin on sol. and insol. substrates is demonstrated.

C. A. R.

**Gambier manufacture in the Far East.** ALEXANDER T. HOUGH. *Cuir* 12, 156-60 (1923).—A description.

H. B. MERRILL

**Present position of the theory of peptization.** W. MOELLER. *Z. Leder Gerberei Chem.* 1, 360-76 (1922); cf. C. A. 9, 2464.—A theoretical paper in which M. discusses the theory of peptization, particularly in connection with its application to tanning and the leather industry. It is shown that the mechanism of tanning consists in the destruction of the sol condition of the peptized soln. by the substance of the hide. The hide substance removes the sol by adsorbing the peptizing agent, and the sepd. coagulated oil surrounds the micellae of hide to form microcrystals. M. defines tan as a system which of itself is quite insol., but by peptization may be converted into a colloidal soln. Leather is defined as an animal hide the elementary particles of which are cryst. micellae protected by a sheath of tan particles from hydrolytic influences.

J. C. S.

**Report of the tannin analysis commission of the French Section of the Society of Leather Trades' Chemists.** G. HUGONIN. *J. Soc. Leather Trades' Chem.* 7, 212-31 (1923).—See C. A. 17, 349.

E. J. C.

**Report on the second series of experiments carried out by the commission of the French Section on tannin analysis.** G. HUGONIN. *J. Soc. Leather Trades' Chem.* 7, 231-41 (1923).—See C. A. 17, 1733.

E. J. C.

**Tanning materials (of Western Australia).** H. SALT. *Inst. of Sci. and Ind. (Australia) Circ.* No. 8, 11 pp.—In Western Australia the following tanning materials are found which might be blended to form raw material for the manuf. of a tannin ext. *Acacia acuminata* (7-15% tans), *A. decurrens* 39%, *A. microbotrya* 18-27%, *A. salicina* 6.5-7.5%, *Callitris calcarata* 17%, *Eucalyptus accedens* 18%, *E. alba* 30-32%, *E. diversicolor* 16-20%, *E. erythronema* 30%, *E. falcata* 5-32% *E. Loxophleba* 5-10%, *E. occidentalis* 20-26%, *E. occidentalis*, var. *astringens* 40-53%, *E. Platypus* 25%, *E. redunca* 16-20%, *E. redunca*, var. *oxymira* 22-30%, *E. Rostrata* 16%, *E. salmonophlebia* 8-13%, *E. salubris* 16-19%, *E. spathulata* 26%, *E. torquata* 17%, and *Hakea glabella* 18%. Marri kino (cf. C. A. 16, 1335) has been solubilized by heating for 6 hrs. in a closed vessel with 15-20% Na sulfite. Mixts. of sulfite and bisulfite were found to be more effective. The addn. of about 5% of potash alum improves the color. An ext. has been made from Marri kino which on analysis gives tans 55.3, non-tans 35.7, insol. matter 0.7, moisture 8.3%; it is sol. and gives a better leather than raw kino.

J. S. C. I.

**Detection of sulfite cellulose in tanning extracts.** G. GRASSER. *Z. Leder- u. Gerberei Chem.* 1, 377-82 (1921-2).—The Procter-Hirst test (C. A. 3, 2395) does not distinguish between sulfite cellulose and humic acids. Where the reaction fails then both sulfite cellulose and dissolved ligneous matter are absent. If humic acid is present a ppt. will be obtained with mineral acids, and  $\text{AcOH}$  will give a ppt., if large amts. of humic acid are present. Sulfite cellulose gives no ppt. with any acids.

J. S. C. I.

**The electrical charge of vegetable tannin particles.** A. W. THOMAS AND S. B. FOSTER. *Ind. Eng. Chem.* 15, 707-8 (1923).—The direction of migration of annin



particles from different sources was detd. at various H-ion concns. by means of the U-tube electrophoresis method. In citrate buffer mixts., oak bark, hemlock bark, wattle bark, sumac, and gambier show a change in direction of migration from anodic to cathodic when the  $p_H$  value is lowered from 2.5 to 2.0. The isoelec. points of the tannins may thus be regarded as lying between these 2 points. A positive result could not be obtained with quebracho because it was pptd. by the acid buffer mixt. Data are given showing the extent of pptn. of tan liquors by different acids as a function of  $p_H$  value.

J. A. WILSON

**Nature of liming and bating.** W. MOELLER. *Z. Leder- u. Gerberei-Chem.* 1, 232-45, 286-97, 308-29, 335-9 (1921-2).—Microscopical investigations have been carried out on the removal of the epidermis from skins in liming, and ultramicroscopical tests on the hydrolysis of the cementing substance and the changes in the collagen fibrils in bating. The protein hydrolysis in liming and bating has been detd. quantitatively by detg. the N in the liming and bating liquors. The hydrolytic decompn. of the individual proteins by bating has also been studied. Liming hydrolyzes proteins to peptones in the first stage. Old limes contain bacteria, and they yield enzymes which cause further hydrolysis to amino acids, and in this way the action of the lime approaches that of a bate. In the bating process the simpler proteins are hydrolyzed to polypeptides, peptides, and amino acids, which take no part in the tanning process. Elastin fibers, muscles, nerves, blood vessels, and other structures contg. aromatic complexes, e. g., tyrosine, are attacked in the latter stages of liming and in bating. White collagen fibers are practically unaffected by bating. Owing to the sp. action of enzymes, artificial bates can never replace the natural bates. Artificial bates to be as effective as natural bates must be prepd. from the enzymes from living organisms.

J. S. C. I.

**Preparation and activity of arsenic-lime unhairing liquors.** E. STLASNY AND R. WÜRTENBURGER. *Collegium* 1923, 43-56.—Lime and arsenic sulfide react to form  $Ca_3(AsS_3)_2$ ; with excess lime, an equil. is set up between  $Ca(OH)_2$ ,  $Ca_3(AsS_3)_2$ ,  $Ca(SH)_2$ , and  $Ca_3(AsO_3)_2$ . It has been shown that the unhairing action of As-lime liquors is due to their hydrosulfide content; pure sulfarsenite solids have no unhairing action. On boiling with excess  $Ca(OH)_2$ , the sulfarsenite is transformed almost quant. into hydrosulfide and arsenite. The reaction takes place at room temp. if the reactants are finely divided.  $As_2O_3$  tends to reverse the reaction and reduces the yield of hydrosulfide. By a secondary reaction, compds. of pentavalent As are formed; this reaction is increased by exposure to air. The S combined with pentavalent As is only partially convertible into hydrosulfide. The max. yield of hydrosulfide was obtained from  $As_2S_3$  or  $As_2S_5$  nearly free from  $As_2S_3$  and  $As_2O_3$ , a suspension of the finely divided sulfide being added to the lime liquor, with min. exposure to the air.  $CaCO_3$  and  $As_2S_3$  react in a manner similar to  $Ca(OH)_2$  and  $As_2S_3$ .

HENRY B. MERRILL

**The leaching of tannin materials.** J. A. REAVELL. *Chem. Age (London)* 8, 506-8 (1923).—An illus. description of the Thornycroft leaching app. for leaching barks, nuts, and wood for the extn. of tannin and dye materials. The plant consists of a vertical Cu tower with a tank near its base into which is fed the material to be leached. In front of the tower is a heater for heating the leach during concn. In the leach is a shaft passing through the center of the tower. At intervals on the shaft are propellers so arranged that rotation causes the whole mass in the tower to raise. The water for leaching is delivered into the top of the tower and travels downwards counter-current to the material. Centrifugal pumps with crosswise circulation help secure max. agitation and extn.

W. H. BOYNTON

**Difficulties in the manufacture of sulfonated oils in the tannery.** JACQUES BOISSEAU. *Cuir* 12, 197-8 (1923).—Where tanners attempt to manuf. their own sulfonated oils, they sometimes fail to appreciate the necessity for close regulation of the conditions of the reaction, under the direction of an experienced technician.

H. B. M.

**Formaldehyde in the tannery.** G. GRASSER. *Cuir* 12, 230-1 (1923).—A review.

HENRY B. MERRILL

**Comparative analysis of tanning materials—1923 committee report.** H. C. REED, et al. *J. Am. Leather Chem. Assoc.* 18, 285-9 (1923); cf. *C. A.* 16, 2619.—The use of larger amts. of kaolin in the detn. of sol. matter results in increased rates of filtration, with but little effect upon the actual detn. Portions of 3 samples of tanning exts. were sent to 19 labs. for analysis by the A. L. C. A. method to ascertain the concordance possible. The extreme high and low values for tannin follow: quebracho, 74.01-71.35; chestnut wood, 30.33-29.29; hemlock bark, 27.35-24.76.

J. A. WILSON

**The bacteriology of the curing of animal skin.** G. D. McLAUGHLIN AND C. E. ROCKWELL. *J. Am. Leather Chem. Assoc.* 18, 233-53 (1923).—The efficiency of in-

hibition of bacterial growth by brine increases with the concn. of NaCl and decreases with the proportion of dissolved protein or of skin to salt used in curing. The addn. of 10% of NaCl inhibits the growth of bacteria in broth at  $p_H = 4.7$ , but not at  $p_H = 6.7$ . When broth is inoculated with bacteria taken from skin, growth is increased by passing air through it, but decreased by the passage of  $CO_2$ . J. A. WILSON

**Direct measurement of plumping powers of tan liquors—1923 committee report.** R. W. HART. *J. Am. Leather Chem. Assoc.* 18, 290-2(1923).—A report of progress. J. A. WILSON

**Liquid sumac extract.** A. RICHVUTO. *Cuir* 12, 165(1923).—Advantages of the ext. over the usual ground product are pointed out. H. B. MERRILL

**The use of lime in the glue and gelatin industry.** R. H. BOGUE. *Ind. Eng. Chem.* 15, 736-7(1923). cf. *C. A.* 16, 4091.—The method of employment and functions of the lime are discussed. HENRY B. MERRILL

**Differentiation of different kinds of glues by means of sulfite-cellulose waste liquor.** L. STEIN. *Chem.-Zig.* 46, 1125(1922).—When 10 cc. of warm 20% bone-glue soln. is added to 200 cc. of sulfite-cellulose waste liquor heated at 50°, an emulsion is produced and a ppt. forms gradually; under similar conditions, glue made from hides yields almost immediately a thick ppt. Gelatin behaves like hide-glue in the test, but the addn. of 2 cc. of 20% gum arabic soln. to the sulfite liquor retards the formation of a ppt. in the case of the glue but not with leaf gelatin. The addn. of 6 cc. of the gum arabic soln., however, retards the formation of a ppt. with leaf gelatin. Gelatin powder yields a ppt. (like hide-glue) when 2 cc. of gum arabic soln. is used, but not in the presence of 6 cc. of the soln. J. S. C. I.

Ash from cutch manufacture as fertilizer (GREENSTREET) 15.

**Tanning glove leather.** HARALD HALLÉN. Norw. 33,996, Jan. 30, 1921.

**Tanning.** J. Y. CONTE. Brit. 189,737, Jan. 3, 1922. Hides are tanned by first satg. them with a soln. of  $NH_4$ , Na, or K tannate, and then decomposing the tannate to liberate tannic acid in the interior of the hides. The  $NH_4$  tannate is prepd. by adding  $NH_3$  to concd. solns. of tanning exts., and is decomposed by heating the soln., preferably under reduced pressure, or by injecting  $CO_2$ . The liberated  $NH_3$  and the liquor remaining after the treatment, which is composed of a weak soln. of tanning exts., may be used for further operations.

**Purifying gelatin and glue.** C. R. SMITH. U. S. 1,457,466, June 5. In prep. gelatin and glue free from mineral matter, acids and alkalies, the material is subjected to extensive dialysis with acidified salt solns., then treated with consecutive applications of neutral salt solns. of gradually decreasing strengths and finally with pure  $H_2O$ .

**Treating hoofs and other animal substances.** E. SCHMIDT. Brit. 189,742, May 1, 1922. Animal substances are treated to obtain a foundation substance free from encrusting matters in a manner similar to that in which vegetable substances are treated to obtain cellulose and remove lignin, etc. In examples, the hoofs of horses, or claws of animals, are treated with a soln. of  $ClO_2$  to yield a colorless substance which is submitted to treatment, e. g., with alkali, to remove encrusting substances, pigments, etc.

### 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

**Adoption of uniform methods of preparation and valuation of raw commercial rubbers.** J. AUDY. *Congrès Production Coloniale Marseilles 1922*, 157-63.—A discussion of the feasibility of such a procedure and of its advantages. A. PAPINEAU-COUTURE

**"Whole" rubber or desiccated latex.** B. J. EATON. *Malayan Agr. J.* 10, 288-94 (1922).—A discussion of the relative merits of "slab" rubber and "whole" rubber by the Hopkinson process. "Slab" rubber from concd. latex is essentially the same as "whole" rubber, for it contains nearly all of the non-rubber constituents of the latex, some of which may confer desirable properties to the raw rubber, and also contains other accelerators formed by biol. changes which take place during maturation of a thick slab of fresh coagulum. Also in abridged form in *India Rubber J.* 65, 806-8(1922). C. C. DAVIS

**Use of rubber latex in making paper (GINSBERG) 23.** Rubber latex in paper (SHAW, BICKING) (KAYE) 23.

**Unvulcanized rubber composition.** F. W. STOCKTON. U. S. 1,455,893, May 22. An unvulcanized compn. adapted for molding and vulcanization is formed of crude rubber 50, an inert filler such as clay, talc or cork 18, finely divided gas black 30 and a softening agent, *e. g.*, paraffin, palm oil or "mineral rubber" 2%.

**Plastic compositions.** A. HERRING-SHAW and S. J. PRACHEY. Brit. 189,242, Aug. 30, 1921. Gels or self-vulcanizing solns. of rubber, balata, or gutta-percha, or mixts. of these substances, prepd. as described in 129,826 (*C. A.* 13, 3040) and 172,754 (*C. A.* 16, 1681), are incorporated with finely divided materials, such as leather, wood-flour, cork dust, waste rubber, and fibrous materials. The compns. are preferably molded under pressure. Cf. 162,429.

**Floor coverings.** COIR TYRE CO., LTD. AND G. D. ROSE. Brit. 189,177, July 26, 1921. Floor coverings of rubber or like material are attached to a backing comprising one or more layers of coir fiber, preferably woven, either alone or mixed with other fibers or fabrics, and impregnated with rubber, gutta-percha, or other adhesive material, the whole being consolidated by pressure and vulcanized. The bottom layer is preferably of pure coir fiber. The coir may penetrate to the wearing surface to prevent slipping. The material may be laid in the form of tiles, or rubber tiles may be applied to the foundation material laid in sheet form. Cf. 115,912 and 144,811 (*C. A.* 14, 3134).

**Driving-belts.** G. ROTHMUND and E. W. KOHLSCHÜTTER. Brit. 189,342, Nov. 19, 1921. Driving-belts are made of woven textile fabric which is first satd. with a weak soln. of rubber and the solvent evapd. This process is repeated until the interstices of the fabric are filled with rubber. The fabric is then dried in air and coated with a paste of rapidly vulcanizing rubber mixt. which is afterwards dried at moderate heat without damaging the fabric. The fabric is then coated with rapidly vulcanizing rubber which is then vulcanized at a moderate heat.

